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No. IV.

ARCHIVES

OF

MEDICINE:

A RECORD OF PRACTICAL OBSERVATIONS, AND ANATOMICAL AND CHEMICAL RESEARCHES CONNECTED WITH THE INVESTIGATION AND TREATMENT OF DISEASE.

EDITED BY

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Illustrated with wood-cuts and lithographs carefully copied from Nature.

LONDON:

JOHN CHURCHILL, NEW BURLINGTON STREET.

MDCCCLIX.

PRINTED BY HARRISON AND SONS, ST. MARTIN'S LANE, W.C.

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CLINICAL OBSERVATIONS.

CASES ILLUSTRATING THE FORMATION OF SO-CALLED "FALSE MEMBRANES," IN CONNECTION WITH THE IMMEDIATE COVERINGS OF THE BRAIN: WITH OBSERVATIONS.

By John W. Ogle, M.D., Oxon,

Assistant Physician to St. George's Hospital. Honorary Secretary to the Pathological Society.

PLATE XXXI.

THE interest attaching to altered conditions and circumstances of any of the structures of the body is proportionate, for the most part, to the intrinsic importance of the functions which as vital organs they perform, or, their relations to adjacent parts which bear that character.

Thus is it, in an especial way, as respects the fibrous and serous tissues forming the membranes investing the brain and spinal chord, the diseases of which tissues occupy, deservedly, so large a share in the minds of all clinical and pathological observers.

In addition to the weighty consideration which diseased states of these structures claim during life, by the symptoms which they establish and which constitute the basis for diagnosis, prognosis, or treatment, perhaps there are no parts of the body more than these, of which the changes as observed after death merit more regard than they do. For in addition to other grounds, it is in a medico-legal aspect especially, that such deviations may form the groundwork for most important conclusions depending upon the supposed origin and behaviour of certain products of unusual occurrence, and most conspicuously as regards what are termed "false membranes" or cysts, between the dura mater and the arachnoïd, or between the

latter tissue and the pia mater, or it may be within the cranial ventricles themselves. The source of such false membranes or cysts has been recognised for some time as being referable to two totally distinct processes; and discussions have at times been raised whether the products in any given instance were due on the one hand to the coagulation of blood directly extravasated from blood-vessels in some way or other ruptured, or on the other hand to the aggregation of inflammatory exudations. This discrimination between two methods of origin has been treated of in the well-known paper by my friend and colleague Mr. Prescott Hewett* on "Extravasation of Blood into the Cavity of the Arachnoïd," and Mr. Hewett has very fully and prominently, in that place, brought to notice the various ways in which membranes or cysts containing blood, whether altered or unchanged, may be formed about the cerebral membranes. He also expresses an opinion that in the majority of cases these products are the results of lesions from outward injury, all traces of which have been long since worn away.

Now, in attempting at all adequately to institute a minute examination into the origin and constitution of such of these structures as are obviously of ancient standing and whose nature is consequently obscure, the following appear to form the most salient points of enquiry:—

Firstly. Is the given subject of investigation (membrane or cyst) merely old standing fibrine which has been deposited under some simple inflammatory process along with the albuminous serum of the blood which has been re-absorbed (or in the case of a supposed cyst, more or less surrounded and hemmed in by coagulated fibrine)?

Or again, is it formed of such above-mentioned fibrine of inflammatory origin having mixed with it, in addition, actual blood globules thrown out as part of the inflammatory process?

Secondly. Is the membrane or cyst in question simply and solely altered blood which has become extravasated? And if so, did the hæmorrhage arise from lesion occasioned by outward injury, or from rupture by inward pressure alone, of the blood vessels; and if it took place from inward pressure only, was this furthered by or wholly independent of organic alteration in the parietes of the blood-vessels?

Or Thirdly, is it, as it were, the result of a union of the two processes; that is, has there been blood extravasated in the

* See page 45, in volume 28 of the "Transactions of the Royal Med cal and Chirurgical Society of London." See also a Report by Mr. Hewett, on a large cyst formed from extravasated bood, in the "Transactions of the Pathological Society," vol. 6, page 10.

first instance, whether as arising from mechanical injury, or from some other cause upon which inflammatory processes have, perhaps consequent to irritation thereby produced, supervened?

Or, in the Fourth place, was the hæmorrhage, if such existed, one of a spontaneous character, and owing to some modification in the constitution of the blood itself, favouring the escape of the globules from the vessels, such as we are well acquainted with as occurring under certain general conditions of the system?

All the foregoing points of investigation have great interest attached to them; but they appear to me to be, owing to a somewhat deficient amount of material on which to build up any conclusions, only as yet to a certain degree capable of final solution.

In such matters experimental research, such as I hope to suggest and further at another time, would materially aid, as also an increase in number of clinical cases and observations with carefully ascertained histories, if they can be had.

As far as my own experience goes, the discovery of these false membranes in connection with the cerebral coverings, and especially as found coating the inner surface of the dura mater, are by no means so rarely to be met with as might be supposed; and I hope to be able to show that they may, not by any means infrequently, be found under local circumstances and general conditions quite different to any which I have already mentioned as being looked upon as their source, that is under circumstances, &c., pre-supposing or requiring neither hæmorrhage of any kind whatever, nor the establishment of active processes of inflammation, whether secondary or not to previous extravasation of blood. Upon these further causes of the false membranes, &c., I will remark at a later period.

I will now proceed to give in more or less detail, certain cases illustrative of the formation of such false membranes, omitting such inferences as may be suggested by them until the narration of the cases be completed.

Case 1, *with Plate.—Epileptic seizures following injury to the Head.—Death from the bursting of a Gastric Ulcer.—Delicate "False Membrane" found after Death lining the inner surface of the Dura Mater covering both Cerebral Hemispheres, and Small Tumour connected with the same surface.—Old fracture of the Cranium.*

The patient was a man, J. S., aged 46, who died in St. George's Hospital, 1856.

Previous History.—He had, some three years previously, been kicked by a horse, and suffered fracture of certain ribs, which was followed by dyspnœa and hæmoptysis. From this accident he was recovering when he fell from his horse on to the back of the head, causing a scalp wound. After this he was delirious for a time but appeared to have recovered so as to go on with his ordinary employment. He was suddenly attacked one day with two convulsive attacks, after which he vomited much dark blood. During the attacks he lost consciousness, but not entirely.

Symptoms on admission.—Face very anœmic, and pulse scarcely perceptible, no doubt from loss of blood; tongue coated thickly, and of a brownish yellow colour. During the next few days he vomited much, but no blood; and he was subsequently attacked with severe epigastric pain, giddiness, and dimness of sight. After vomiting quantities of dark brown material he gradually sank and died.

On Post-mortem Examination—*Thorax.*—Nothing of moment was found within this cavity.

Abdomen.—A small simple ulcer in the upper part of the anterior surface of the stomach was found, as well as a very large one in the posterior wall blocked up by an adherent pancreas. Through the ulcer in the anterior wall the contents of the stomach had found their way into the general peritoneal cavity.

Cranial cavity.—The soft parts covering the cranium presented nothing unusual. An extensive fracture of the cranial bones on the left side was found, a large part of which was united, but the lower half was still ununited, the interval being filled up by fibrous tissue. The exact condition of the bone thus ununited, &c., has been fully and minutely described by my friend Mr. Gray, who brought it before the notice of the Pathological Society,* along with the remarkable condition of the left lateral sinus and jugular vein, &c.

But in addition to the fracture of the bone, I found the following peculiarities, which were not recorded in the Pathological Transactions. The dura mater generally appeared to be healthy, but was far more than usually adherent to the skull; and lining its inner surface on both sides of the brain a fine and delicate fibrous structure was found: connected also with the inner surface of the dura mater at the middle of the left side and at a point about two inches from the falx cerebri was a small white tumour raised at its greatest height about ¼ of an inch from the surface, and gradually sloping down to the level of the dura mater. Corresponding to the tumour was a depression of the surface of the cerebral hemispheres which at this point was otherwise healthy and not over vascular: and around the tumour, the dura mater and the corresponding arachnoïd membrane were intimately adherent. Moreover very firm and plentiful and reticulated adhesions were found to exist between the arachnoïd and the dura mater corresponding to the extremities of the anterior and middle cerebral lobes on both sides. These adhesions also contained a quantity of reddish or brick-coloured material. Two or three of the convolutions of the anterior and middle lobes, just mentioned, were indurated and corrugated, but the immediately surrounding tissue to a slight extent, and especially the white matter, was very softened. In other respects the brain tissue was natural, and the ventricles, except a few well-marked cysts of the choroïd plexus, presented nothing worthy of observation.

Microscopical Examination.—On examining the brain itself, the hard and corrugated parts, where were the coloured adhesions, were seen to contain a large number of fat-covered capillaries, along with much granular matter and free fat globules, and also vast numbers of round and oval-shaped granulated darkish masses. The surrounding softened parts of the brain contained numbers of nerve-cells obviously undergoing fatty changes; and fatty and granular matter were met with in abundance. The minute capillaries did not present anything worthy of comment.

* See the "Transactions of the Society," vol. 7, page 282.

The yellow-coloured reticulated adhesions presented, amidst delicate fibrillated tissue, much granular and fatty matter, and also numbers of oval and round brownish-red small masses with variously sized irregular bodies of a calcareous nature, many of them possessing a concentric arrangement.

The fibrous false membrane before mentioned as lining the dura mater, was seen to consist of a granular looking stroma (see PLATE XXXI, fig. 1) containing very delicate and fine fibres coursing chiefly in a parallel direction, and having mixed with it here and there largish aggregations of a yellow and yellowish-brown coloured granular material (see Fig 2), some being disposed in an oval and rounded form, unaffected by the addition of acetic acid or sulphuric ether. Moreover, in various places, were evident remains of blood globules, and also small faintly outlined round and oval corpuscular elements of about twice their dimensions, some of them passing into fibres. Mixed with the above there was a good deal of calcareous matter in places, many of the calcareous bodies having a concentric character.

Besides these elements numbers of capillary blood-vessels were seen containing in the substance of their walls nuclei of an oval shape, and occasionally beset with reddish-brown calcareous particles and glomerules of various sizes. Almost all these capillary vessels sent off branches at nearly right angles, which thus formed an infinite number of somewhat irregularly-shaped quadrilateral meshes, as seen in the Plate, fig. 1.

The small white tumour, spoken of in connection with the inner surface of the dura mater, was found to consist of a thick and firm outer portion, having all the microscopical characters of fibrous tissue, and an inner or contained part of a yellowish white colour and very softened. The whole had the appearance of having been originally a mass of fibrin, of which the central portions had softened, broken down, and undergone fatty and calcareous transformation.

Case 2.—*Epilepsy.—Hæmoptysis.—Petechiæ.—"False Membrane" lining the Dura mater.—Extravasated Blood in the Arachnoïd Cavity.*

The patient was a man, J. H., aged 41, who died in St. George's Hospital, in the year 1849.

History.—He had been for some time attending the hospital as an out patient, owing to cough and hæmoptysis. On the day of his admission into the hospital he had an epileptic attack, after which he had lost his consciousness. He rallied for a time from his insensibility, but again relapsed and was brought in unconscious but without decided coma or paralysis. Subsequently coma came on and stertorous breathing. It was noticed that he had many petechial spots on various parts of the person. He died very shortly.

ON POST-MORTEM EXAMINATION.—The cranial bones with their coverings were found to be natural. The brain and the dura mater were healthy, but lining the inner surface of the latter membrane as it covered the upper part of both cerebral hemispheres, though extending much further on the left side than on the right, was a layer of false membrane of a rusty or pale brick colour, and of about the thickness of a piece of cartridge paper,—this structure was rather firmly adherent to the dura mater, and at one part, corresponding to the upper and front portion of the anterior cerebral lobe, it was closely adherent to the arachnoïd membrane itself.* A quantity of dark coloured extravasated blood was also found accompanying this false membrane between the dura mater and the arachnoïd covering

* This specimen may be seen in St. George's Hospital Museum, as No. 1. a. Sub-series 6, Series xxi.

both cerebral hemispheres, and within the meshes of the pia mater, covering the outer part of the right hemisphere of the brain. A small quantity of semi-purulent fluid was also found in the sub-arachnoïdœan spaces at the base of the brain.

The other organs of the body presented nothing particularly worthy of remark.

Microscopical examination showed a decidedly fibrous character of the false membrane; the fibres having in places some resemblance to wavy fibres as found in many textures of the body, and having in places mixed with them, the débris of blood globules which had undergone change. No blood-vessels could be detected in the structure.

Case 3.—*Thin False Membrane Lining the Inner Surface of the Dura Mater, associated with Thickening and Opacity of the Arachnoïd Membrane.*—"Scrofulous" *Deposit in the Lungs.*—"Carcinomatous" *Deposit in the Pleura, Liver, Lymphatic Glands, and Supra-renal Capsules.*

The patient was a French woman, A. D., aged 38, who died in St. George's Hospital in 1856.

Symptoms on Admission.—When admitted she was complaining greatly of pain in the course of the left ureter which she said she had been subject to for nine months. She was pale and emaciated, but free from any peculiarly cachectic look, and she was troubled with cough and frequent expectoration. Her nights were very disturbed, but there was apparently no interference with any of the mental faculties, and no headache was complained of. For some time she improved considerably, her only complaint being of that excessive debility, and occasional tympanitis along with the above mentioned want of sleep. Diarrhœa came on and she quickly sank.

Treatment consisted of sedatives, such as henbane and morphia, for the want of sleep, and general tonics and stimulants with cod liver oil.

Post-mortem Examination.—*Thoracic Cavity.*—The pleura in several places presented nodules of undoubted medullary "*carcinomatous*" matter, and on both sides of the chest the apices of the lungs were found to contain miliary deposits of "*scrofulous*" matter; otherwise, the lungs were healthy. The heart was small in size and flabby, but otherwise natural.

Abdominal Cavity.—The liver was found to be very large, and to be in several places occupied with circular masses of soft medullary carcinomatous material. Similar malignant deposits were met with in the lymphatic glands of the mesentery, omentum, and lumbar region. The kidneys also were much occupied by this malignant material, especially the left one, the proper substance of which was almost entirely destroyed. Both supra-renal capsules were entirely infiltrated with the same kind of deposit.*

Cranial Cavity.—The cranial bones and their coverings were healthy. The brain and cerebellum were also healthy in all respects, but lining the dura mater covering the upper parts of both lateral cerebral hemispheres (which was itself apparently external) a layer of recent soft fibrine was found, and this was the case to a greater extent on the right side of the cranium. This layer of fibrine was tolerably adherent to the inner surface of the dura mater, and could without much trouble be peeled off as a distinct diaphanous membrane of pretty firm consistency. The arachnoïd membrane generally was opaque and somewhat thickened, and much clear serous fluid was situated immediately subjacent.

* In connection with this altered condition of the supra-renal capsules the freedom from any discoloration of the skin must not pass unnoticed.

Microscopical Characters. — Passing over the microscopical appearances of the deposit found in various organs of the body,* I will only dwell on those of the "false" or fibrinous membrane found lining the inner surface of the dura mater. This presented the well known appearances of fibrillation which exuded fibrine, or as it is yet sometimes termed, "lymph," undergoes. Some amount of evidently fatty granular and amorphous albuminous matter existed also, but no distinct cell structure was met with; and in no portions examined could I discover traces of any vascular formation or débris of blood-globules, hæmatine, &c.

Case 4.—This was one of which the only history attainable is that the patient suffered during life from "compression of the brain." The specimen consists of a portion of the dura mater covering both cerebral hemispheres, having attached to its inner surface, though more extensively on the right side than on the left, a layer of reddish-yellow or brick-coloured "false membrane." This substance is also much thicker on the right side than on the left.

The preparation was removed from the body of a man very many years ago, and was presented to the St. George's Hospital Museum by Sir B. C. Brodie.†

Microscopical examination, after maceration for many years in spirit, showed a granular and delicately fibrillated material containing, here and there, small rounded and nucleus-like pale corpuscles and accumulations of round and oval brownish red, and in places garnet-coloured material, the whole greatly cleared by acetic acid. No blood-vessels were any where met with.

It appears to me that in this case, although the history fails, yet the known fact that the patient was said to have had "compression of the brain" during life, renders it very highly probable that he had suffered from some accident, as at that period especially, the expression "compression" would only be made use of in connection with what may be termed, for the sake of distinction, some surgical cause.

Case 5.—*Epileptic Attacks and Headache following a Blow on the Head.—"False Membranes" found adherent to the Inner Surface of the Dura Mater.*

History.—The patient was an intemperate man, aged 37, who nine months before death received a blow upon the head, and who had been subsequently liable to epistaxis, giddiness, indistinct vision, headache, and epileptic seizures. He died of coma in connection with disease of the kidney.

I have already given the details of the case at page 5 of the sixth volume of the "Transactions of the Pathological Society," along with some observations, and therefore I say but little concerning it in this place. I cite it here without giving the particulars of the case, as I am anxious to include it amongst those kindred cases which I am now adducing. Suffice it to say, that, on *post-mortem examination* a very delicate, but at the same time firm, "false membrane" was found lining, and rather firmly adherent to, the under surface of the dura mater. It was quite smooth and glossy, and excepting one or two places, where slight remains of blood extravasation existed causing small patches of a reddish hue, was uniformly of a white colour. It could be split up into two or three laminæ.‡

Microscopical examination showed the membrane to consist of numbers of delicate fibres interwoven and mixed with a homogeneous substance, in which many nuclear bodies were seen. No blood-vessels were found in its substance, and no epithelium covering its free surface.

* The simultaneous occurrence of scrofulous and carcinomatous deposit not only in the same body, but even in the same cavity of the body, should not pass unobserved.

† It is now catalogued as No. 3. a. Subseries 6, Series xxi.

‡ I have added this specimen to the St. George's Hospital Museum as No. 1. a. Subseries 6, Series xxi.

The arachnoïd covering the cerebral convolutions was quite natural and transparent.

In this case it seemed that one or two of the small arteries coursing along the surface of the brain which were very highly atheromatous, rigid, brittle, and prominent, had been snapped by the external injury to the head, and that in this way hæmorrhage had taken place into the cavity between the dura mater and arachnoïd immediately covering the cerebral hemispheres.

Case 6.—*Thin Layer of Fibrinous Material forming a "False Membrane" lining the Inner Surface of the Dura Mater. —Peculiar Pedunculated Growths connected with the Arachnoïd Carcinomatous Disease of various Organs.*

This case has, like the last one, been related by me in the "Transactions of the Pathological Society" on account of the peculiar villous growth of the anachnoïd.* In the details of the case thus seen, I only mentioned the fact without dwelling upon it, that a thin false membrane was found lining the dura mater covering both cerebral hemispheres. In this case the anachnoïd, in addition to the growth from it, was found opaque and thickened to a certain degree.

This condition of things was found after death quite fortuitously, the patient having died of malignant disease of the liver, kidneys, &c. The cranium, brain, &c., were healthy, as also the cerebral vessels; nothing was found noteworthy about the cranial contents excepting the above mentioned growth from, and altered condition of, the arachnoïd, along with the thin membrane coating the cerebral surface of the dura mater.

(*Cases to be continued in No. V.*)

CASES ILLUSTRATING THE USE OF THE OPHTHALMOSCOPE.

By Robert Taylor, F.R.C.S.,

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AND

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PLATE XXVI.

IT is proposed in the following series to lay before the profession short notes of cases in attendance at the Central London Ophthalmic Hospital, comprising their histories, symptoms, the ophthalmoscopic examinations, accompanied by coloured drawings, and the results of treatment. The cases will not, at present, be arranged in any nosological classification, but merely recorded as they present themselves in the ordinary routine of hospital practice; at some future time, probably, an attempt may be made to group the symptoms and appearances together, so as to form some deductions as to

* See vol. 9, page 14.

treatment. The sketches in all cases will be taken from the patient by Mr. Taylor or Mr. Hulme, and chromo-lithography in the skilful hands of Mr. Tuffen West has in the present instance been selected as the means of publication. There is, and probably always will be, great difficulty in correctly representing the natural transparency of parts of such delicate structures as the inner tunics of the eye, but chromo-lithography affords a brilliancy of colour which is permanent, and a capability of multiplication which frequent printings do not impair.

Case 1.—William Mackay, æt. 28, a clerk, applied December 13, 1858. His health has been tolerably good from his childhood; he has passed through the ordinary complaints of that period, and in his youth has had several gonorrheas, but no venereal sores. His sight, as long as he can remember, has always been weak, and he has also suffered more or less from frequent headaches.

At the time of his application his sight had become so impaired that he was obliged to give up his work as a clerk; he complains of requiring more light than usual to be able to distinguish ordinary type. When he reads he is obliged to place the candle between his eye and the book. With his right eye he can read small print tolerably well at about eight inches distance, but the sight of the left is not nearly so good. He complains also of heat, aching, and general uneasiness in exercising his sight.

The eyes appear healthy to external examination; palpation normal; some internal venous congestion is shown by enlarged veins leaving the globe, and there are brown spots at their points of penetration of the sclerotic.

Ophthalmoscopic Examination.—*Left eye.*—Fig. 1, Plate XXVI.—The cornea, the lens and its capsule, and the vitreous humour are clear. The optic disc appears strongly shaded, especially towards the temporal side, throwing the centre into high relief. There is a general hyperemia of the disc, more towards the nasal side, and this side is also very faintly marked with very fine bluish striæ. The optic disc preserves its circular shape. The retinal vessels enter and leave normally, being rather more branched than usual. Two small arteries perforate the disc towards its outer edge, taking a direction towards the macula lutea. The retina preserves its transparency uninterrupted. The choroid is also normal, a pale bluish shade surrounding the optic disc.

The space around the macula lutea is healthy.

The treatment consisted of small doses of grey powder, with bark and soda three times a day, and blisters twice a week to the temples, with complete rest for the eyes.

Second Ophthalmoscopic Examination, February 13, 1859.—The appearances remain much the same, with the exception of the almost total disappearance of the faint blue lines on the optic disc.

Vision remains much the same.

This patient is still under treatment. He expresses himself as always being relieved by the use of the blisters, which he uses twice a week alternately to either temple.

Case 2.—William Brown, æt. 36, has been employed for many years as an engraver on metal, working chiefly at the ornamental engraving of gun locks. Nine months ago he discovered that the sight of the left eye was impaired, his attention being drawn to it by a dull, aching pain, and the appearance of flashes of light before it, after having worked for some hours. Since then the sight has got gradually worse, and now he can only discern the outlines of large objects passing before the eye, but can neither distinguish features, nor read the largest

print. He still complains of pain and coruscations after some hours' work. The right eye is asthenopic.

Ophthalmoscopic Examination.—*Left eye.*—Fig. 2, Plate XXVI.—The optic disc is of a dull grayish pink colour, slightly marked with faint striæ of a more decided pink. The colour gradually fades off towards the centre, which is of the normal white appearance. The circumference of the disc is surrounded to about two-thirds of its extent, by a jet black line of pigment deposit; for the remainder, towards the outer side, by a shade, as if the disc were slightly elevated above the surrounding parts. The vessels of the arteria centralis retinæ are much enlarged and distended, and their contents have not the usual bright tint of arterial blood. Several of the vessels in their course over the retina are bordered on each side by a fine, white line, probably of plastic exudation. The entire retinal surface that can be brought within the field of vision is of a much brighter red than in the healthy eye, and presents a velvety appearance which completely conceals all traces of the choroidal vessels, as well as of the macula lutea.

Case 3.—John Devine, æt. 39, blacksmith, applied February 1858. He is a man of healthy constitution. About 4½ months ago his left eye was injured by a blow from a piece of iron. The cornea has partially sloughed and has healed up by a fibrous cicatricial tissue; there is, however, sufficient clear cornea at the outer margin to make an artificial pupil as he has perception of light in that eye.

The right eye presents the appearance represented in the sketches Nos. 3 and 4. It was damaged 22 years ago by a blow while at the forge; the pupil is semi-dilated; the iris tremulous. By fully dilating the pupil with atropine, it appears, on examination with the ophthalmoscope, that the capsule of the lens remains suspended in its ordinary position, and is clear, sufficiently so, to examine the optic disc, and one or two vessels seen entering its centre. The lenticular matter is apparently absorbed, except the nucleus of the lens, which has sunk down and remains unabsorbed at the bottom of the capsule. On making the patient look up to the ceiling, and throwing the head well back, the appearance as shown in fig. 4 is seen—two fine lines being the remains of the suspensory ligament are seen to be the means by which the capsule is held in its position. Two small patches of uvea may be distinguished on the inner side of the capsule.

This patient has very fair sight with this eye; he can see large letters, and to get about in the street. He has been under observation about a year, with no sensible alteration in his state.

N.B.—The optic disc and its vessels, as seen through the transparent capsule, is hardly sufficiently represented by the lithographer.

Case 4.—Mary Smith, æt. 53, married, 14 children, a stout, plethoric-looking woman, her face covered with acne rosacea, applied for chronic ophthalmia of the left eye. About 16 to 20 years ago she discovered that the sight of the right eye was much affected, every thing appearing dim and ill defined. She has never suffered from any inflammatory attack in the right eye, although two or three times the left has been affected. She can read the ordinary type with her right eye, when brought quite close to her. Increase of light causes increased confusion.

The eye is healthy in appearance; in fact, she does not complain of it at all, but merely observes that this eye is always tired and feels uneasy first, when engaged about her work.

Ophthalmoscopic Examination. — *Right eye.*—December 10, 1858. — The cornea, the lens and its capsule, and the humours are quite clear. The optic disc presents the appearance represented in fig. 6, when the eye is everted. It has not the clear defined circular edge observed in the healthy optic disc. The surface of the disc is highly injected with numerous fine vessels, to such an extent on the outer side that the continuity of its circumference is quite lost. Numerous small vessels are seen directed towards the macula lutea, and large

tortuous branching vessels perforate the centre of the disc. Black pigment is seen deposited on the surface of the disc, as well as round its edge. The white, roundish, clear cut spots observable are due to the bright sclerotic shining through the choroid, which is atrophied and deficient in its pigment at those parts.

Fig. 5 represents parts over the macula lutea of the same eye as seen by making the patient look directly forwards. Here there is extensive choroidal deficiency, the edges of the atrophied choroid taking circular forms as though they were cut out with a circular punch. Pigment is deposited irregularly about the fundus. Enlarged choroidal vessels are seen taking their course in that membrane, and one large retinal vessel enters the eye at a purplish spot in the situation of the macula lutea and ramifies in the retina itself.

Treatment.—Iron, with small doses of sulphate of magnesia, have improved her health, and the acne has almost disappeared. Vision remains the same with the right eye.

[*To be continued.*]

CASES IN THE MEDICAL WARDS OF KING'S COLLEGE HOSPITAL.

Reported by Charles Parsons,

House Physician.

Case 1.—*Cancer of the Stomach.*

J. K., æt. 44, a teacher of music, married, was admitted under Dr. Budd, on February 3rd, 1859, with cancer of the stomach. She has had four children, the last of which was born eighteen years ago. Her health has always been delicate. Six years ago she vomited a wash-hand basin-full of blood, and a tea-cup-full twelve months ago. Complains of pain after eating, and for the past ten months has vomited after meals, and has lost flesh. In July last she had inflammation of the bowels (peritonitis?) and was laid up for four months. Six months ago she first noticed a small roundish swelling at the lower part of the belly on the right side, which gradually increased in size. About seven weeks ago the abdomen began to swell, and continued to enlarge up to the time of her admission.

Present condition.—Much emaciated; features sharp and pinched; expression anxious; eyes sunk; is too weak to stand; tongue red and glazed; has no appetite; vomits everything she takes, and suffers from diarrhœa. The catamenia were regular till last Christmas. At the lower part of the abdomen on the right side, an irregular, ill-defined nodulated tumour can be felt, tender on pressure. Has great abdominal pain, cannot breathe in the recumbent posture, and sleeps little.

P. 76, R. 32.—Ordered logwood, krameria, and opium, to check the diarrhœa, and laudanum at night. To take also three minims of dilute hydrocyanic acid three times a day. Is much troubled with acid eructations. Complains of cough. *Rhonchus* audible over entire chest. *Expectoration* viscid, muco purulent. Distinct fluctuation in the abdomen.

February 16.—Is rapidly getting weaker, and more emaciated. Wanders a good deal. A creaking sensation was communicated to the finger on pressing in a slanting direction on the abdominal parietes. She gradually became weaker and more exhausted, and died on February 20, 1859.

Sectio-cadaveris, twenty-eight hours after death. Great emaciation; abdomen flaccid and fluctuating; several quarts of clear yellow serum, with a few shreds of lymph, escaped on opening the belly. The peritoneal covering of the intestines and abdominal walls was of a velvety consistence from the presence of a thin layer of partially organized lymph. The coils of small intestine were firmly matted together so as to produce the nodular projections, which were observed during life. Both the large and small intestines were filled with light yellow very offensive fœculent matter, and were bound down by the thickened mesentery, as well as by bands of adhesion to the abdominal parietes.

The liver, spleen, stomach, and transverse colon were closely connected, so much so, that it was difficult at first to ascertain the precise position of the stomach. On laying open this viscus it was found to be divided by a central cartilaginous constriction, about 1½ inches in thickness, forming a valve scarcely larger than the pyloric orifice, between the two halves of the stomach, which consequently assumed the hour-glass form. The stomach was very much contracted. The portion between the cardiac orifice and the constriction was scarcely large enough to hold a pear; and that towards the pyloric end, though longer, was of even smaller capacity. The gastric mucous membrane was thrown into deep corrugations, and exhibited, on microscopical examination, the usual appearances of stomach tubes, &c. The constricting ring consisted of a dense and closely set fibrous stroma, with granular matter, and a few small cells without nuclei. Liver enlarged but healthy; kidneys, uterus, ovaries, &c., quite normal in position, form, and texture.

Heart and lungs quite healthy, the former small and contracted, the latter crepitant and somewhat anemic.

Case 2.—*Hemiplegia.—Hemorrhage into Corpus Striatum and Optic Thalamus of Right Side extending into the Hemisphere.*

Martin Lambert, aged 53, a waiter, health usually good. He has lived intemperately; has never been subject to epilepsy or headaches.

On the afternoon of March 6, 1859, while standing behind "the bar," he suddenly felt a trembling in his limbs, fell down, and was unable to raise himself, but did not lose his consciousness; he was brought directly to the hospital, and admitted under the care of Dr. Todd.

On admission the left side of his face was found to hang somewhat, and was incapable of expression; the cheek flapped to and fro with respiration; he could not whistle, nor move the jaw from side to side, and had some difficulty in swallowing; his articulation was very imperfect; he had to make several efforts to protrude the tongue, and when he succeeded, it deviated towards the left side.

There was no paralysis of the muscles of the eyeball, or of the orbicularis palpebrarum. Pupils equal, contracted readily. Vision, sense of hearing, and smell, much impaired on the left side. Left arm and leg almost completely powerless. His excreta were passed unnoticed, but the sphincter ani retained a good deal of power. The biceps cubiti, and the hamstring muscles, were rigid. Sensation was almost entirely absent in the paralyzed parts. Heart's action tremulous. Pulse 96, full, throbbing, incompressible.

He was kept quiet in bed with the head raised, and a mixture of nitric acid and bark was ordered. Within twenty-four hours sensation had returned in some measure, and he could move his leg a little. At the end of a week he could move either of his limbs with ease, and sensation had almost returned; but he complained of pain in the head, and was unable to sleep. On March 20, he lost all desire for food, and became less able to move the limbs. Notwithstanding the free use of stimulants, he sank and died on the 23rd.

From the loss of motor power and of sensation of the left side, Dr. Todd considered that there was some lesion of the

corpus striatum and optic thalamus of the right side; and as his mental power was much impaired, it was probable that the substance of the hemisphere was also considerably affected. Dr. Todd thought there was white softening as there was no loss of consciousness at the time of the seizure, and as the power of the limbs speedily returned. That a clot was also present was shown by the muscular rigidity, but this was supposed to be a small one at the time of admission.

Examination of the body forty-eight hours after death.—Body well nourished, muscles well developed.

Cranium.—Dura mater unusually adherent to the calvarium. There was a good deal of serous fluid in the subarachnoïd space. The substance of the cerebrum was somewhat wasted, but generally of normal consistence. There was also much fluid in the lateral ventricles; the right corpus striatum and optic thalamus appeared bulged upwards, and on section a large cavity was found hollowing out the posterior part of the optic thalamus and the corpus striatum and extending some distance into the white substance of the hemisphere. This contained fluid and a tolerably firm clot. It was surrounded by softened brain tissue, which was found by the microscope to contain numerous granular corpuscles composed of minute oil globules and wasted nerve tubes, vide Plate xxxii, fig. 2. The softening extended some distance into the substance of the hemisphere as well as into the corpus striatum and the optic thalamus.

The pons and medulla appeared much shrunken, but the rest of the brain was healthy. No other organs were examined.

ORIGINAL RESEARCHES IN ANATOMY AND PHYSIOLOGY, AND MORBID ANATOMY AND PATHOLOGY.

ON SUBSTANCES DISCHARGED FROM THE URINARY BLADDER.

By Arthur Farre, M.D., Cantab. F.R.S.
Professor of Obstetric Medicine, in King's College, London.

I.

ON DIPLOSOMA CRENATA, AN ENTOZOON, INHABITING THE HUMAN BLADDER, AND HITHERTO OFTEN CONFOUNDED WITH SPIROPTERA HOMINIS.

PLATES XXVII. AND XXVIII.

In Number II of these Archives I commenced a series of papers, "On substances discharged from the uterus and vagina." That series is now interrupted by the intercalation in the present number of the first of a similar series, having for its object the elucidation of certain obscure points relating to substances discharged from the urinary bladder.

The subject selected for the present communication is one of especial interest. Forty-eight years have elapsed since the entozoon, which I propose to describe, was first noticed in one of the earliest numbers of the Medico-Chirurgical Transactions.*

Since that period no similar example appears to have occurred. Although it is possible that some of the cases on record in which worms have been said to escape from the bladder may have been of this kind. No descriptions, however, with which I am acquainted, afford satisfactory evidence that the worm referred to in this paper, has been observed in any other case.

The circumstances which have brought me into relation with this unique case are the following, viz.:—On several occasions, I visited the woman, together with her medical attendant,

* Case of a woman who voided a large number of worms by the urethra; with a description of the animals. By W. Lawrence, Esq., Med. Chir. Trans., vol. ii, p. 385, 1811.

and removed some of the worms from her bladder, so that I had personal evidence that the entozoon about to be described came from that viscus. Many of the entozoa so obtained, as well as other specimens,* since furnished to me from the same source, are still in my posession. At the death of the woman, I had the opportunity of conducting the post-mortem examination.

Several years have elapsed since the latter event, and inasmuch as the circumstances just adverted to have placed it in my power to communicate many facts and particulars not yet recorded, I am anxious to take an opportunity of making these known, especially since neither the original description of this worm, by Mr. Lawrence, nor that which many years subsequently I gave in the Library of Medicine (vol. v, p. 241, Article, "Worms"), wherein I ventured to distinguish it by the title of *Diplosoma crenata*, and claimed for it a reception among the true sterelminthous entozoa, appear to have satisfied helminthologists of its title to be so regarded.

Doubtless this hesitation has arisen first through veneration for the great authority of Rudolphi, by whom these worms were declared to be mere lymphatic concretions, forming casts of fistulous sinuses, imagined by him to exist in the bladder of the patient. And secondly, from the absence of any sufficiently precise description of the organization of this creature, as well as of the state of the viscus, from which it was expelled; information upon the latter point being obtainable by post-mortem examination only.

To supply this needful evidence; to vindicate the title of this remarkable parasite to be regarded as a distinct organism; and to point out the position which it appears entitled to occupy among the recognised entozoa of the human body are the objects of the present essay.

History of the case.—The first portion of the following history is briefly epitomised from that originally furnished at considerable length by Mr. Lawrence (loc. cit. p. 385).

Mary Pearson, aged 24, (in 1811), of a healthy and strong constitution, was seized in the winter of 1806, with retention of urine, requiring the daily use of the catheter. From the sensation of weight in the bladder, lumbar pain and numbness of the thighs which she experienced, added to the circumstance that

* The specimens extant with which I am acquainted, besides my own, are those in the Royal College of Surgeons and University College Museums. Many specimens were also formerly in the possession of Mr. Barnett and Mr. Complin, and these, together with some now possessed by Dr. Hare, I have, through the kindness of each of these gentlemen, been permitted at different times to examine.

she could seldom pass water, and then only in drops tinged with blood, it was surmised that she suffered from calculus, but, upon the introduction of a sound none could be detected.

After passing a considerable time in two hospitals, where the catheter was used twice daily, and where the same opinion of her cure was entertained, she passed in the summer of 1809, to the care of Mr. Barnett. At this time she exhibited symptoms of considerable constitutional disturbance. She had become emaciated; suffered much pain and burning heat in the bladder, and whenever the catheter was delayed longer than usual she was seized with violent convulsive fits.

Again the sound being used produced in the patient a sensation as if the instrument had struck against a ball at the top of the bladder. This was followed by a fluttering within her, as if something was moving. The constitutional derangement continued to increase, the local symptoms all became aggravated, and the repetition of the use of the sound was followed on several occasions by exceedingly violent convulsions.

In order to prevent mischief from over distension of the bladder, the catheter was, on one occasion, left in the urethra. After passing a very restless night the sensation of motion became very distressing, and, although the urine had escaped as fast as it was secreted, the bladder seemed greatly enlarged. Mr. Barnett was now much surprised on removing the catheter to find, insinuated through its orifice, what appeared to him a roundish worm, about the thickness of a piece of bobbin, an inch and a half in length, and of a white colour. Upon a repetition of this experiment, of which Mr. Lawrence also was now a witness, three worms were brought away, two of them most curiously entangled in the orifice of the instrument, and the third coiled round the end.

With a view to procure the expulsion of the worms, oil of turpentine was now administered by the mouth. The influence of the medicine after repetition became very painful and the inclination to urinate so urgent, that the patient, yielding to it, passed a pint and a half of water, containing four worms. The only natural evacuation of urine that had taken place since Mr. Barnett's attendance.

This remedy, however, producing, after a short time, unfavourable symptoms was abandoned, and now a very large catheter open at the end, and furnished with a stilette that filled the orifice while it was introduced, was employed. On withdrawing the stilette a free passage was left for the contents of the bladder. In less than half an hour, nine worms came through, with a tablespoonful of sandy matter, four of these worms being five and a half inches in length. In the course of the next few days fifty-two worms passed in the same manner in quantities varying from one to nine at a time. On injecting the bladder with turpentine and water more were brought away. The numbers varying from ten to thirteen on each occasion.

Slight motion of an undulating character was observed in some of these, but they were mostly dead; sometimes the worms she had passed through the catheter were observed as low down in the bed as the patient's feet. She continued discharging worms in much the same way until, at length, in October, of the same year, the number that had been passed was estimated, by Mr. Barnett, at not less than 800 to 1000.

The worms passed in this case were of two different sizes, and, as will be presently shown, chiefly upon the authority of Rudolphi, who was furnished with specimens of both, *were of two totally different kinds*. The larger worms were mostly from four to six inches in length. They were those passed in the manner, and in the large numbers already stated. One of these worms is represented in the lower figure of the plate which

accompanies Mr. Lawrence's Paper. It is the worm which I have designated *Diplosoma crenata*, and which forms the chief subject of the present memoir.

The smaller worms were passed on only one occasion. In this instance a portion of mucus came away, involving several small worms, from half an inch to an inch in length, which lived in the urine for three days, and moved very briskly. This worm is figured in the upper part of Mr. Lawrence's plate. It is the worm referred by Rudolphi, though with some hesitation, to the genus Spiroptera, and named by him *Spiroptera hominis*.*

The completion of the history of this case I am enabled to furnish from my own observations. The patient remained in the condition last described, with only slight variation, until the year 1836, when through the kindness of Mr. Complin (then the partner of Mr. Barnett), to whose care she had passed, I had the opportunity of repeatedly seeing her. She was then an occupant of the workhouse of St. Sepulchre, bed-ridden and, though yet only forty-nine, having the appearance of premature old age. The catheter with the open end was still constantly employed, and no urine was passed without it. When warm water was occasionally injected through this, a few worms of the larger kind still passed. They were not, however, usually now so large as the earlier specimens, although they presented otherwise the same characters, but in a less marked degree. Seldom more than two or three were now obtained at any one time.

In addition to the worms, I also procured in the same way numerous, round or angular bodies, of the size of small pin's heads, which, on several occasions, passed through the catheter along with the urine. I have satisfied myself by repeated careful microscopic examination that these possess the unquestionable characters of true ova.

Finally, the ova first, and then the larger worms, ceased to be passed, the smaller ones having been evacuated on only one occasion, which as already stated, was previous to my first acquaintance with the patient. And at length, after suffering thirteen years more of the same kind of bed-ridden life, the catheter having been required to the last, the patient died, July 10, 1849, of apoplexy and paralysis.

Through the kindness of Mr. Complin, I was enabled to

* It is important that this fact of the passage of two kinds of worms should be specially noticed, because much misapprehension appears to have arisen through ignorance of this fact, and by consequence the two worms, though so different in structure, have been often confounded together under the same name.

make the post-mortem examination. This was a matter of great importance, both on account of the opinion expressed by Rudolphi* that the larger worms were not entozoa at all, but were probably only lymphatic concretions, or casts of fistulous sinuses which he imagined to exist in the bladder in this case, and also because it was possible that, although the worms had long ceased to be passed, still some light might be thrown upon their original seat or source. The examination disappointed any such expectation, at least, in so far as it furnished only negative results. But it had this advantage, that it served to refute the conjecture, hazarded by Rudolphi, respecting the existence of fistulous passages. No such sinuses were any where found, nor any trace of such having previously existed. The most careful scrutiny of the whole urinary track, including the kidneys, ureters, bladder, and urethra, made both at the time, and afterwards, when the parts were preserved in spirit, disclosed nothing but the most perfect and healthy condition of all these parts.

It is only necessary to add to the foregoing facts, collected from Mr. Lawrence's history and from my own observations, a brief notice of the statements of Rudolphi respecting this case.

Rudolphi, as he informs us,† in 1816, received from Mr. Barnett, through a mutual friend, three phials, containing respectively specimens of the three substances passed in this case, viz., the ova, and the larger and smaller worms.

1. The ova were declared by Rudolphi to be lymphatic concretions.‡ I have already stated, however, that they possess the characters of true ova, and I reserve for a future communication both the evidence upon this point, and also any observations that may appear called for as to the probable independence of these ova, or their relation to either of the other substances.

2. The larger worms were also declared, by the same authority, to be lymphatic concretions,§ formed in supposed fistulous passages. The evidence afforded in the present communication will, it is hoped, not only suffice entirely to refute this statement, but also to confirm the opinion which I have elsewhere‖ long ago expressed as to the true animality and zoological position of this entozoon.

* Entozoorum Synopsis. C. A. Rudolphi. Berol. 1819, p. 251.

† Loc. citat. 250.

‡ Ovula vero sic dicta concrementa sunt lymphatica in vesica morbosa ex humoribus alienatis ibidem secretis, simili forsan modo ac arenulæ ex lotio præcipitata. L. c. p. 251.

§ Concrementa sistunt lymphatica sinubus vel ductibus fistulosis vesicæ originem debentia. Lympham in canalibus fistulosis coactam passimque compressam filum inæquale efformare crediderim. L. c., p. 251–2.

‖ See Tweedie's Library of Medicine, vol. v. loc. cit.

3. The smaller worms furnished to Rudolphi were of the kind which, as already stated, were passed on one occasion only. This constitutes the Spiroptera hominis of Rudolphi, who found it to be a true nematoid worm. The specimens submitted to him were both male and female. They were from eight to ten lines in length, and, besides the generative organs characteristic of each sex, were furnished with a distinct alimentary canal, mouth, and anus. These features, as well as the great elasticity (Rudolphi) and semi-transparency (Lawrence) of these smaller worms prove that they were widely different, in general character and organization from the larger kind. Hence it seems difficult to account for the circumstance that these two have been very often confounded together. Such confusion may have arisen partly from want of reference to Rudolphi's original account, and partly from the fact, that while none of the smaller worms (originally few in number) are now extant, at least in this country,* specimens of the larger kind, derived from the same case, are still tolerably abundant, and have been in some instances preserved, under the impression that they were examples of Rudolphi's Spiroptera.†

Thus it appears that the same case has furnished two distinct forms of worms, both previously unknown as parasites of the human body, and of these one only has been as yet received into the category of true entozoa.

The description which follows applies to the larger worm only, the generic and specific characters of which may be thus given:—

Genus. Diplosoma. (Mihi.)

Corpus molle, fibrosum, teretiusculum, utrinque attenuatum in medio constrictum anguloque acuto inflectum; os, tractus intestinalis, anus, genitalia, nulla.

Diplosoma crenata

D. Margine membranoso crenato.

Hab. In hominis vesica urinaria.

This worm, Plate XXVII, fig. 1–3, is of tolerably firm consistence, and of a dull white or yellowish brown colour. It measures from four to six or even eight inches in length, and from one to two lines in thickness. The earlier specimens were of the larger, and the later almost all of the smaller dimensions. It is thinnest in the middle where it is bent upon itself at an

* Possibly those sent to Rudolphi may be still preserved.

† See for example the preparation of *Diplosoma* in the Museum of the Royal College of Surgeons. No. 174, A. Nat. Hist. Series, lettered *Spiroptera*.

acute angle, so that the two halves hang nearly parallel, and give to the entozoon an appearance as of two worms tied together by their heads. As this is a constant and very striking feature, and is evidently not dependent upon accidental conditions, but arises from a peculiarity of construction, I have selected it to characterise the genus. Diplosoma, *διπλοος*, duplus, *σῶμα*, corpus.

At the point opposite this angle there is often a rough surface, Fig. 4, as if at this part there had been a point of attachment, which had been broken, but in other cases, and especially in the smaller specimens, instead of a rough surface, there is here only a sharp twist, like a kink in a rope. Fig. 3.

From this central point the body gradually swells out towards the extremities, but contracts again within half an inch of either end, and terminates in some cases in a pointed extremity, and in others in a ragged end, which is occasionally furnished with a loose membranous flap. Fig. 1.

The upper or dorsal surface is convex. Fig 8. The under or ventral, fig. 6, 7*a*, is formed usually of two planes meeting in an obtuse angle, and leaving between them a longitudinal groove. Or the ventral surface is plane, but furnished with a similar groove. So that a transverse section of the worm presents usually a more or less trigonal or tetragonal outline, especially in specimens contracted by long preservation in spirit. In the abdominal groove lies often an interrupted narrow strip or band of a delicate corneous structure.

Along the line of junction of the dorsal and abdominal surfaces, there runs on the outer side a delicate membranous border, the margin of which is beautifully crenate, and upon examination with a moderate magnifying power, the crenations themselves are seen to be again crenate. Fig. 5, 6, and 7, *a*, *b*, *c*. A similar margin, less pronounced, is often observed upon the opposite lateral border, fig. 6, and 7 *d*, but the two sides are rarely equally fringed.

The worm is solid throughout, and formed of a nearly homogeneous parenchyma. It presents no trace of an alimentary canal, nor is it furnished with either mouth, anus, or generative organs of any kind.

Although there is, as is usually the case in the sterelminthous entozoa, no distinct integument,* none that can be dissected off and separately displayed, yet the external surface presents a peculiar tegumental structure. The principal fea-

* This is one of the circumstances which was considered by Rudolphi as militating against the admission of this substance into the class of entozoa, for he observes, Tota undique substantia homogenia, nuspiam cute tecta, quod me

tures of this are shown in fig. 18. Under an amplifying power of 100 to 200 the nucleated cells, composing the outer surface are observed arranged in groups, between which little furrows ramify as in the bark of an elm-tree. These groups of cells lie upon a scarcely perceptible basement membrane, which is thrown up into longitudinal ridges, composed of narrow bundles of simple nearly inelastic fibres of a white fibrous tissue. These traverse the length of the worm, after the manner of sticks in a faggot, and serve to support the cells and hyaline basement membrane just mentioned.

In order to strengthen these longitudinal fibres, others somewhat coarser and more prominent are arranged cross-wise, running round the body, like the cords which bind up a sheaf or bundle. Fig. 18.

Examined with a higher power (× 420), these cells, $\frac{1}{1000}$ to $\frac{1}{400}$ inch in diameter, are seen filled with minute granules, each cell usually containing also a nucleus. Fig. 15.

When sections are made deeper in the substance of the worm, this part is found to be composed of white fibres, of a slightly elastic kind, inclining chiefly in the longitudinal direction. They are not united by any intermediate substance, but intermixed with them are many small granules, and occasional cross fibres. Fig. 17.

In the deeper parts of the body, as well as in the superficial cross bands of integument, and also attached to the corneous strip, are numerous fibres of a very peculiar appearance. These have, to a certain degree, the character of voluntary muscular fibre, and probably are of that nature. Each fibre consists of numerous fine elementary cords of sarcous substance, enclosed in a translucent sarcolemma, the whole bundle so constituted being thrown into numerous sharp zig-zag folds, which produce an appearance of transverse markings. Fig. 14. Examination with a high power (× 450) discloses the true nature of this appearance. Fig. 16.

The same appearance is observed also in the fibres of which the fringed and crenate margin is composed. Fig. 12, and 13 *a. b.* But here the fibres are of a finer character, and the zig-zag arrangement is still closer, so that these fibres require a very careful examination, in order to discover that this appearance results from angular foldings, and not from exactly parallel transverse markings as in ordinary voluntary muscular fibre. Fig. 13 *c.*

judice argumentum crucis est. Nullum enim datur entozoon, cui cutis denegetur, quodque coctum albumen nudum referat. But the microscope in Rudolphi's day was not capable of resolving such a structure into its constituent elements.

On one occasion, in dissecting into the substance of the worm near one extremity, I came upon a slender white cord, arranged like a nerve with one or two branches, running longitudinally. Fig. 9. Not having at that moment a microscope at hand, I could not determine its nature, and I have not since observed this structure.

In several specimens numerous shining tendinous-looking bands of fibres were observed crossing the abdominal aspect of the worm, near the extreme ends of the body. Fig. 1. These are composed entirely of inelastic fibres of white fibrous tissue.

The only remaining structure discoverable in this singular entozoon is a slender corneous band occupying the groove on the abdominal aspect of the body. This, which is perhaps the most remarkable of all its component structures, is not a constant feature. In some specimens, and especially in the smaller ones, it is often imperfect, or altogether absent. When present it always occupies the position above stated, either extending the whole length of the worm or only to a short distance, in which case it is usually found near the extreme end. It is firmly attached to the flesh, and when torn out many of the zig-zag muscular fibres are brought away with it. Fig. 10. It measures $\frac{1}{3}$ to $\frac{1}{2}$ line in breadth and is of the thickness of ordinary writing paper. It is of a brown or deep gamboge colour, and possesses considerable strength and toughness. It may be regarded as a fragmentary dermal skeleton serving to give support and strength to the soft body of the worm.

Examined with a moderate amplifying power, this structure is seen to be thickly occupied with numerous very close-set spots, fig. 10, which at first appear like small pores, but which, with a higher power, are at once resolved into cells, lying in a single plane, and though presenting some resemblance to cartilage cells, yet having peculiar characteristics of their own.

Each cell has the form of two watch-glasses apposed at their edges, and is either round or ovate. The cells are empty or contain very minute granules, mostly adherent to their inner surface. A very minute bright spot in the centre of many, but especially of the larger cells, appears to be a pore or orifice (possibly, however, a nucleus). Fig. 11.

A great number of the cells may be observed in various stages and degrees of spontaneous fission. The division may start from one side and extend to the central pore, and then pass through the complete cell, dividing it into two. When this process is complete, the two resulting cells may in many places be seen lying in close apposition. Some of the lower cells exhibit a stellate margin similar to that often observed

in blood disks whilst drying. The smaller cells are in some instances arranged in a close linear series, as in the dark line observed extending down the centre of fig. 10.

With regard to the position of this worm in the zoological series, it ought, in my opinion, as Professor Owen* has already hinted, to be placed among the lowest of the Sterelminthous entozoa.

If speculation is allowable as to the manner of subsistence of this singular parasite, we may conjecture that, since it is entirely destitute of mouth and alimentary canal, an arrangement which, in a creature living in urine, will not perhaps excite surprise, nutrition must have been effected most probably by imbibition of this fluid, or of some of its selected constituents, by means of the nucleated cells forming the outer or tegumental layer of its body. And that thus materials were supplied for the growth of the very simple elements of which the solid parenchymatous texture of the worm is composed.

That this entozoon possessed certain powers of spontaneous motion is several times stated in the history, and this power it probably enjoyed by virtue of the peculiar form of muscular fibre, apparently of the voluntary kind, what has been described.

As to the origin of the worm, it would perhaps only embarrass a subject already sufficiently obscure, to offer a conjecture here. As no trace of reproductive organs of any kind could be discovered, its origin and mode of propagation must remain a matter of pure speculation.

The patient herself, on one occasion in conversation with me, ascribed the commencement of her illness to drinking water from a certain tank or well. Mr. Complin, however, thinks that she used to trace it to sleeping in a hayfield.

In whatever light this case is viewed it constitutes a remarkable example of an individual in rude health becoming a prey to two distinct entozoa, neither of which have been known to inhabit the human body before or since, or, indeed, to have existed in any form, one of them being of so unusual a structure that the most distinguished helminthologist of his time, without hesitation, denied its animality. While not less remarkable is the record of the sufferings of this unfortunate individual, all the best portion of whose life was embittered, and who was finally brought to a premature old age and death, through the influence of this singular parasite.

* See his article "Entozoa" in Todd's Cyclopædia of Anatomy and Physiology, vol. ii., p. 124.

ON SOME POINTS IN THE ANATOMY OF THE KIDNEY OF MAN IN HEALTH AND DISEASE.

By Lionel S. Beale, M.B., F.R.S.

II.

ON THE STRAIGHT VESSELS (VASA RECTA) IN THE PYRAMIDS OF THE KIDNEY.

THE origin of the numerous straight branches of vessels (vasa recta) in the medullary portion of the kidney has been described differently. It has been held by some that these vessels were derived directly from the artery, while others have been led to infer that they arose from the efferent vessels of Malpighian bodies. The latter view was held by Bowman, who considered that all the blood carried to the kidney by the renal artery passed through the capillary vessels of Malpighian bodies, with the exception of a very small quantity which supplied the capsule. Professor Virchow has lately published some researches with the view of proving that many of these vessels do come off directly from branches of the artery.* Virchow considers that the circulation in the medullary portion of the kidney is more free than in the cortex, in consequence of the blood in this region not passing through Malpighian bodies. He thinks that the secretion, as it passes down the straight portion of the uriniferous tubes, becomes concentrated, and thus accounts for the deposition of solid crystalline matter in this part of the kidney. In diseases of the kidney, in which the circulation through the cortex is impeded, the blood may circulate through these straight vessels, and thus be carried off by the renal vein without passing through Malpighian bodies at all. When these vessels are congested, albumen, fibrin, and blood may escape, and Virchow believes that it is in this part of the organ that the different forms of casts of uriniferous tubes are principally formed, and that in this situation the causes of many morbid conditions of the kidney will be found. These observations are of great importance in connexion with morbid conditions of the kidney, and as the views

* Einige Bemerkungen über die Circulations-Verhältnisse in den Nieren. Von Rud. Virchow.—Virchow's Archiv. Band. XII.

put forward differ from those generally held by observers in this country, it is very desirable that the question should be further examined.

Although my observations fully bear out many of the conclusions arrived at by Virchow, who used opaque injections, I was quite unable to satisfy myself of the arrangement by examining such specimens. There was always a confused appearance, and it was very difficult to make out, at all clearly, the course and destination of an individual vascular trunk, especially when the specimen was dried and mounted in balsam. Many of the drawings appended to Virchow's paper are by no means so clear with regard to this point as could be wished. It seemed to me, therefore, desirable to investigate the subject in a somewhat different manner, in the hope of ascertaining exactly the nature of the arrangement in question.

The preparations from which my observations have been made were injected with the transparent blue injection,* and immersed in glycerine. Thus the tissue is made very transparent, and the manner in which the vessels are arranged can be more easily determined than by examining opaque injections, which often appear very confused, and in most cases it is quite impossible to trace the course of a single vessel. Another advantage of this mode of preparation is that the vessels on several different planes can be seen in one specimen.

The branches resulting from the subdivision of the renal artery lie in the interval between the cortical and medullary substance of the kidney. Many of them pursue a more or less horizontal course for some distance, and divide into branches which pass towards the surface of the kidney, giving off on all sides small branches which supply Malpighian bodies. In the medullary substance are numerous bundles of nearly straight vessels which pass towards the *apices* of the cones, and communicate with capillaries from which the blood is received by numerous venous radicles, which pursue a similar nearly straight course towards the *bases* of the cones. As the larger branches of the artery and vein lie between the cortex and medullary portion of the kidney, the blood must circulate from this point in two directions in the arteries,—outwards towards the surface, —inwards towards the apices of the pyramids, and in the veins, of course in opposite directions.

Most of the straight vessels may be traced backwards to the efferent vessels of Malpighian bodies (Plate XXIX, figs. 2, 3, 4, 5, &c.), but some appear to be quite unconnected with them,

* The composition of this fluid is given in a paper on "Injection," page 18.

and to be derived directly from the artery. (Figs. 1, 4*b*, 10, 11.) Sometimes the single efferent vessel from the tuft pursues a very long tortuous course, and there is the greatest chance of its being divided in making the section, fig. 4*c*, so that unless the vessel be actually traced to an arterial trunk we must not conclude that it was unconnected with a Malpighian body. It is necessary to examine a great many specimens cut in various directions to demonstrate the origin of these straight vessels.

That many of these vessels actually come off from arterial trunks, as Virchow states, there cannot, I think, be much doubt. Often there are two, three, or even four branches of the artery running close to each other for some distance, which at last terminate in these straight vessels, or anastomose with other branches, fig. 1. The horizontal branches often anastomose, and very frequently one horizontal vessel given off from a large trunk anastomoses with one springing from another. Thus a communication between many of the larger branches is established in this part of the kidney, and in case of obstruction of the trunk of an artery, the circulation through its tributaries would still be maintained. In fig. 1, near *a*, this point is very well seen. In case the Malpighian arteries should be obstructed, it is obvious that much blood would be carried off by the horizontal branches communicating with the straight vessels of the pyramids. In ordinary injections many of these branches are not filled at all, so that they are not observed, and I have reason for believing that in the preparations from which my drawings have been made, many vessels are not injected. In cases of disease, where the circulation through the cortical portion of the kidney was interfered with, the greater part of the blood would pass down the straight vessels in the cones, and would be returned by the veins. These straight vessels in disease gradually become enormously enlarged, and their coats thickened, and the capillaries themselves become as large or larger than the straight vessels are in health. I have noticed in some cases, the long nearly straight tube with numerous transverse markings throughout its entire length. These are evidently circular muscular fibres, and sometimes from their increased thickness they form quite a projection in the interior of the vessel. This fact proves that some of the so-called *vasa recta* have the structure of small arteries, and it is to the firmness of their coats, in great measure, that the well-known hardness and density of this part of the kidney, as compared with the cortical portion of the organ, is due.

In certain cases as Virchow has suggested, much fluid and albumen permeate the coats of these vessels, and pass into the

straight portion of the uriniferous tubes, and there can be no doubt that in some instances, when the Malpighian bodies are completely altered in structure, and the convoluted portion of the uriniferous tubes much changed, other constituents of the urine are separated from the blood in this region. At the same time I cannot think with Virchow, that casts of the tubes are, for the most part, formed in the straight, and not in the convoluted portion of the uriniferous tubes. That some casts are formed there, seems probable, from their size and form;* but at the same time the evidence in favour of casts being formed very generally, (and Dr. Johnson, I believe, thinks universally), in the convoluted portion of the uriniferous tube, cannot easily be overthrown. The majority of English physicians, who have followed Dr. Johnson in studying this subject I am quite sure agree with him, in the opinion that the character of the cast is a question of great practical importance, because in many cases the exact condition of the *secreting* or *convoluted portion* of the uriniferous tube, at the time of its formation can be predicated. If the cast be formed in the straight or *ductal* portion of the uriniferous, we can, of course, gain no information with respect to the character of the epithelium in the convoluted or *secreting* part of the tube. In this country, for some years past, the diagnosis of many renal diseases has been based on the characters of the casts met with in the urine, and I doubt if any modern researches have contributed of late years more real service to practical medicine, than Dr. Johnson's investigations. Again, in not a few instances, the casts themselves have been actually seen in the convoluted portion of the uriniferous tubes in post-mortem examinations, and this portion of the tube has been often observed distended with blood. The epithelium in the convoluted part of the tube in cases of fatty degeneration of the kidney, both in man and animals may often be observed to be quite filled with oil globules, while that in the straight part is perfectly clear, and transparent, and contains only delicate granules, as in health. Before death, many casts have been present in the urine, with numerous fat cells, entangled in the meshes of the coagulable material, exactly resembling those found after death in the secreting part of the uriniferous tubes. Such evidence can be obtained, almost at any time, in a London Hospital,† and it

* "Illustrations of urine, urinary deposits, and calculi," p. 39.

† In this country, particularly in London, kidney disease, and especially fatty degeneration is much more common than on the Continent. In a small hospital, a week seldom passes without several such cases presenting themselves for admission.

seems to be quite conclusive as to the importance of the character of the casts in the diagnosis of kidney disease, and proves, incontestably, that casts of moderate diameter (about 1-700th of an inch), and of small diameter (about 1-1000th of an inch), are formed in the convoluted portion of the uriniferous tube. Many of the large straight casts are no doubt developed in the straight portion of the tube. It has also been shown that blood, at least in numerous cases, escapes from the capillaries of the Malpighian bodies.

With regard to the deposition of insoluble salts in the straight portion of the uriniferous tube, almost the only solid urinary deposit, as far as I can ascertain, which is formed in the kidney at all, is that composed of dumb-bells of oxalate of lime, and occasionally phosphates. Octohedra of oxalate of lime, uric acid, urates, phosphates in most instances, cystine, &c., are deposited after the urine has left the uriniferous tubes altogether.

Although, therefore, my observations fully confirm those of Prof. Virchow, with regard to the origin and arrangement of many of the straight vessels of the pyramids of the kidney, I can only in part agree with his conclusions with reference to the action of these vessels in diseased states of the organ. There can be no doubt that, as he has suggested, in conditions where any obstruction exists to the free circulation through the Malpighian bodies and vessels of the cortex, much of the blood sent to the kidney, regains the renal vein, by passing through the *vasa recta*, or straight vessels of the pyramids which spring from arteries, and it is very possible to suppose cases of disease, in which, for a short time previous to death, scarcely any blood passed to the cortex. As I have shown, however, there seems no convincing evidence in favour of the view that blood and albumen escape in the majority of cases into the straight portion of the uriniferous tubes, or that, as a rule, casts are formed here, and not in the convoluted portion of the tube. All the evidence which I have been able to collect points to the secreting or convoluted portion of the tube, as the seat of the formation of casts (with the exceptions previously alluded to), and the vessels of the Malpighian body, as those through which, for the most part, the albumen of the blood transudes, and by the rupture of which, blood corpuscles escape into the uriniferous tubes. Again, there seems to me no evidence to show that absorption takes place in the straight portion of the tubes, and I doubt if any change whatever occurs in the density of the urine, after it leaves the convoluted part of the tube. Surely the wide channel, the direct and straight course of the tube in

the pyramid, the firm structure of this portion of the kidney, and the thickness of the vascular walls, are all conditions unfavourable to the passage of fluid from the tube into the blood, while, on the other hand, they would seem to favour very much the rapid escape of the secretion from the gland structure, as soon as possible after its formation.*

* See some remarks on the comparison between the anatomical structure of the liver and kidney. "The anatomy of the liver of man and vertebrate animals."

REMARKS ON THE FORMATION OF CERTAIN URINARY CALCULI AND OF THE DUMB-BELL CRYSTALS OF OXATATE OF LIME.

By Lionel Beale, M.B., F.R.S., &c.

SOME time since I was surprised to find, in an abundant deposit of octohedra and dumb-bells of oxalate of lime, some comparatively large oval crystalline masses, of which two are represented in the "Illustrations of Urine Urinary Deposits and Calculi." (Calculi, plate I, figs. 2 and 3.) I had often met with in other cases, small collections of three, four or more dumb-bell crystals, but had never seen before a crystal resembling one of those figured (fig. 2). All the different forms occurring in the present case, were evidently composed of the same material, as they possessed the same refractive power, and were insoluble in acetic acid and potash. These larger masses might then be looked upon as minute oxalate of lime calculi, formed in the same manner as the dumb-bell crystal. In not a few instances, microscopic calculi were met with in the sediment from the same specimen of urine, presenting almost every transitional stage between the dumb-bell and the small but perfectly formed calculus above referred to. The dumb bell then, being the origin of this small calculus, and the latter clearly an early stage of formation of the ordinary calculus, it becomes interesting to ascertain the precise seat of the formation of the dumb-bell and circular and oval crystals, all of which I regard as very minute microscopic calculi.

The above urinary deposit seemed to me a very highly interesting one, as in it I was enabled to study urinary calculi

at the most important time of their history, namely, at the earliest period of their development. It is well known, that the octohedra of oxalate of lime are commonly developed in the urine after it has left the organism; and if urine which contains very minute octohedra be allowed to stand for a few days, these may often be observed to increase in size, until at length they become very large crystals, while at the same time a number of new ones are developed. On the other hand, dumb-bell crystals are present in the urine when passed, and they do not increase in size or number if allowed to remain in the urine. These dumb-bell crystals seem to be formed in the uriniferous tubes, as the following evidence will show, and probably the greater quantity of the material of which they consist, is deposited in the straight portion of the tubes in the pyramids. In a case of Cholera, after many hours' suppression, the urine contained a little albumen, with a few casts of the uriniferous tubes. Many of these casts contained dumb-bells. Octohedral crystals were found in small number in the surrounding fluid, but not one was to be detected in the cast. (Illustrations, Plate XXII, fig. 1.) It is probable that where octohedral crystals are met with, connected with casts, they are deposited merely upon the surface of the cast, after the urine has been allowed to stand for some time. I have seen many times a number of these dumb-bells impacted in the tubes of the kidney, especially in the pyramids. Indeed if thin sections of this portion of human kidneys be made, these dumb-bell crystals will be observed not unfrequently. Often several may be seen in the wide portion of the tube, just before it opens upon the surface of the mamilla. Although I have here chiefly spoken of dumb-bell crystals, it must be borne in mind that many different forms are included under this head. The various forms of these dumb-bell crystals are given in the "Illustrations," plates XI and XII; and also in "The microscope in its application to practical medicine," 2nd Edition. I have met with a great many specimens of urine containing dumb-bells, but have been unable to associate the appearance of these crystals with any particular morbid condition. It may be interesting to refer to a few of these, which occurred in the Hospital some years ago. During six months I met with ten or eleven cases, in which these peculiar crystals were present, out of about 400 cases in which the urinary deposit was examined; but I have not observed that the urine containing them possesses any characters by which we might be led to suspect their presence, before resorting to microscopical examination, and from my own observations, it does not appear that the dumb-bells are connected with any

peculiar form of disease, or with any particuliar diathesis. They occur usually mixed with the ordinary octohedra of the oxalate, but I have found them alone; frequently they are accompanied with urate of ammonia and crystals of uric acid, and often with both. Out of ten cases in which they were present, eight were men, and the remaining two were women, above the age of 21. Of these ten cases, nine occurred between the months of September and January, and one in April, but this may be accounted for by the fact, that during the winter I have always made a much greater number of microscopical examinations than during the summer months. It may prove intercsting to give a list of the cases in which these dumb-bell crystals, or crystals allied to them in form, occurred. They were present in

One case of chorea.
Two cases of cholera.
One case of chronic rheumatism.
One case of contraction of the skin of the neck and upper extremities, the condition to which the term "hide-bound" has been applied.
One case of boils, occurring in various parts of the body.
One case of paraplegia, depending upon diseased vertebra.
One case of attempted poisoning by taking half an ounce of oxalic acid.
One case of eczema.
One case of epilepsy.

Out of these ten cases, in which the dumb-bell forms of crystal were present, it will be observed that only two instances occurred in which they were found in the urine of patients afflicted with a similar disorder, and it is somewhat curious, that these should be cases of cholera. The nature of the other cases differ so entirely from each other, that it appears difficult to suppose that this curious form of crystal is any way dependent upon the nature of the malady, but we are rather led to conclude, that these crystals arise from certain conditions in the secreting action of the kidney, unconnected with any particular disease. The dumb-bell crystals often occur in the urine of persons not suffering from any special disorder at all, who consider themselves in good health; but generally there is languor and loss of appetite, with uneasiness after eating, and the individual, without being able to give an account of any particular ailment, complains of not being quite well. Dumb-bells often occur in cases where little exercise is taken with a full diet, and small

quantity of fluids. The concentration of the fluids, and the imperfect oxidation, are probably causes of the formation of these crystals in cases of cholera.

I propose now to consider briefly the characters of some of the small calculi found in the specimen of urine above referred to. Sometimes several dumb-bells adhere together, forming an irregularly shaped mass, which gradually becomes smooth by the deposition of the same material in the interstices, until a small, nearly spherical or oval, mass is formed. In other cases, it would appear that one or two crystals grow at the expense of the rest, and a perfectly uniform oval crystal, composed of course of numerous acicular crystals, radiating from a common centre, results. Thus the dumb-bell crystal becomes the nucleus of a small calculus, and it is easy to see how this may increase in size by the deposition of new matter externally,—at first, while it remains in the straight portion of the uriniferous tube, or in that system of irregularly shaped cavities at the apex of the mamilla, formed by the convergence of several of the large tubes,—then in the pelvis of the kidney or ureter, and, lastly, in the bladder itself.

Chemical Composition of the Dumb-bell Crystals. — The chemical composition of these crystals has long been a matter of dispute among chemists, but it may now be regarded as nearly certain that they consist of oxalate of lime; for since it has been shown, that the dumb-bell may gradually grow into a small calculus, and that the latter is composed of oxalate of lime, it follows that the dumb-bell, or *microscopic* calculus, has the same chemical composition. The chemical composition of these crystals has long been questioned by different authorities. As is well known, Dr. Golding Bird concluded they were composed of oxalurate, and not oxalate of lime. Dr. Thudichum brings forward evidence to show, that they consist of oxalate, and overthrows the validity of Dr. Golding Bird's objection to this view of their composition. The argument I have brought forward, cannot but be regarded as strongly in favour of the conclusion, that these curious crystals consist of oxalate of lime, although their composition has never been ascertained directly. (The statements made as to these crystals being composed of uric acid, can only have arisen from the most erroneous observations, seeing that they are quite insoluble in potash, while all forms of uric acid are readily dissolved by this reagent.) For no difference in chemical character, refractive power, or in the action of polarised light, can be detected between the minute dumb-bell and oval crystal, and the largest masses present in the specimen of urine, referred to in the com-

mencement of this paper. There could not, in fact, be the slightest doubt of their being the same substance, in different stages of growth. Nor could there be any question of the latter being, in their turn, an early condition of the small renal oxalate of lime calculi.

Upon examining a few uric acid and other calculi, I have found a small nucleus, composed of oxalate of lime. I believe that future observations will prove, that in the great majority of instances, the formation of the calculus commences by the development of a small mass composed of oxalate.* The deposition of successive layers of uric acid, urate of ammonia, phosphate, oxalate of lime, &c., is to be referred rather to the state of the urine in which the solid body lies at the time, than to the persistence of those conditions upon which the first formation of the calculus depended. Any foreign body in the bladder of a person in good health will soon become incrusted with some of the least soluble of the urinary constituents.

It is well known, that under certain circumstances, urine undergoes a kind of acid fermentation, which favours the precipitation of uric acid, or urates in an insoluble state. The precipitation of octohedra of oxalate of lime, and of triple phosphate, depends upon certain changes taking place in the urine after its secretion. The dumb-bell form of oxalate of lime is almost the only substance which is precipitated in an insoluble form, during the secretion of the urine, and in that part of the kidney which must be regarded as the secreting portion of the gland. In some cases, the small phosphatic calculi, which are occasionally met with in great number in the kidney, may be observed to possess a nucleus, composed of mucus or of epithelial particles and epithelial débris. The nucleus of others seems to consist of granules of earthy phosphate aggregated together, and converted into a small mass by being mixed with a little mucus. The phosphatic calculi which are so often met with in the prostate are also very frequently formed round a nucleus, consisting of a few cells of epithelium; and a considerable quantity of organic matter is deposited with the earthy salt. If these calculi are dried, the organic matter of course shrivels up, leaving in the centre a small cavity. The dumb-bell crystal may then form the nucleus of an oxalate of lime, of a uric acid, of a phosphatic, or other calculus.

Dumb-bell crystals have been detected in the urine at all periods of life, and I have seen them in the uriniferous tubes

* Since this paragraph was written, I have obtained several dumb-bell crystals from the nucleus of uric acid calculi, by acting upon them with potash.

of the newly born child. These curious crystals are much more common than is generally supposed, but in consequence of their being present in the urine of a person only for a few days at a time, they often escape observation altogether. Without doubt there are many cases in which dumb-bell crystals escape from the kidney without the formation of a calculus. These crystals are so minute, that there is every chance of their passing off in the urine; but should they be produced in persons whose urine is in a state in which deposits are readily formed, it is very likely that a collection of them should become covered with the insoluble material, and thus a small calculus becomes formed, which, if still retained, will gradually increase until it obtain a considerable size. In cases, therefore, in which these crystals are met with in the urine, it is desirable to interfere. Their expulsion from the uriniferous tubes should be encouraged, by giving ordinary diuretics and large quantities of water, and we may endeavour to prevent their formation by recommending good air and exercise, and a good but simple and moderate diet, with small quantities of wholesome stimulants, and two or three doses of the mineral acids every day. In short, encouraging the activity of the oxidizing processes in the organism, which prevent the formation of uric and oxalic acids, &c.

The principal points advanced in this communication may be summed up as follows:

1. That the dumb-bell crystals are formed in the uniferous tube, while the octohedra are not deposited in the kidney at all, and in many cases not until the urine has left the bladder.

2. That under certain circumstances the dumb-bell crystals, if retained in the tubes of the kidney, become aggregated together, and so form the nucleus of a calculus. In other instances, a single dumb-bell grows into a small calculus.

3. The nuclei of oxalate of lime calculi, of uric acid, urate of ammonia, phosphatic calculi, &c., may be composed of dumb-bells.

4. Dumb-bells, like urinary calculi, occur at all periods of life.

5. The chemical composition of the dumb-bell is, doubtless, the same as the oxalate of lime calculus, of which it is but an early stage, and consists of oxalate, and not oxalurate of lime.

6. As it has been shown, that dumb-bells may grow into small calculi, it is very important to promote their expulsion from the kidney as soon as possible.

RESULTS OF THE CHEMICAL AND MICROSCOPICAL EXAMINATION OF SOLID ORGANS, SECRETIONS, ETC., IN DISEASE.

BLUE DEPOSIT IN THE URINE, FROM A SPECIMEN SENT

By Dr. Eade, Norwich.

THE blue deposit from urine which is represented in plate XXXII, fig. 4, was obtained from an old man of 83 years of age, who was under the care of my friend, Dr. Eade, of Norwich, to whom I am indebted for the specimen and for the following notes of the case. Considerable difficulty was experienced in obtaining the man's history, for although, for his age, he was very strong and robust, his mind was not very logical, and it was very difficult sometimes to be certain of the information he gave.

Case.—C. A., æt. 83. Tall, strong, and robust-looking for his years; formerly a soldier, but now and for many years a weaver. Has several times suffered from ulcerated legs, and four years ago had an abscess in left testis, which soon healed.

Six months ago, he rather suddenly began to suffer from a desire to pass water more frequently than usual, as often as once in one, two, or three hours, both by day and by night, the quantity passed at one time seldom exceeding a teacupful, and the urine being turbid and strong smelling.

He can assign no cause for this ailment. Never had a blow upon back or loins. Is not subject to gravel. Has no stricture. Has never suffered pain in back, belly, perineum, or thighs, but complains of a cutting pain or uneasiness at end of penis just before and during the act of micturation. Urine escapes freely, never stops suddenly during its flow. Never passed blood or small stones. Has been treated without much benefit by acids, quinine, opium, buchu and steel.

Jan. 26.—It was to-day observed that a small white chamber-pot, into which he passes his urine, was stained all round the bottom and sides of a bright blue colour. He says that this blue deposit has been present for several weeks past.—(*Note.* For several weeks his medicine has been Tr. ferri sesquichlor. and opium.)—The urine is turbid, of a dirty greenish yellow colour, highly ammoniacal to the smell, but to test paper neutral, if not faintly acid. After standing, a copious whitish precipitate occupies the lower part of the vessel, leaving a clearer portion above. Sp. gr. 1015. Coagulable with heat and nitric acid. A few phosphates thrown down by lig. potassæ. The microscope shows nothing but pus globules in large quantity.

March.—Three weeks ago had a slight temporary attack of facial paralysis. Says that but for his bladder he would now be in good health. The urine is still passed almost as often as ever. Diet consists of cocoa for breakfast and tea in the evening. Solid food, chiefly bread and butter. Seldom takes any beer.

The urine which I received was alkaline, and rather dark in colour. It contained an abundant deposit. After allowing this

deposit to subside, it was observed that the upper part was light and flocculent, and of a *dark blue* colour. The lower portion of the deposit consisted of numerous crystals of triple phosphate and altered pus globules. The supernatant fluid, after the subsidence of the deposit, was turbid, but its colour resembled that of port wine and water.

The coloured deposit consisted of several strata. The layer lying immediately upon the deposit of triple phosphate was of the colour of Prussian blue, but the most superficial part was of a dark purple hue.

The blue deposit, although when diffused through the fluid appeared pretty abundant, when collected was found to be much too small for a careful examination. It was not altered by *potash*, *soda*, or *ammonia*, and *acetic acid* and strong *nitric acid* produced no change.

The microscopical characters of the blue deposit are shown in plate XXXII, fig. 4. It will be observed that there are bodies of different tints. The masses with little crystalline spiculæ are invariably of a dark purple colour, but there are also a number of bodies varying in size and form, many of which seem to be made up of smaller, almost spherical masses. These are bright blue, almost of the colour of Prussian blue. It is probable, however, that they are both composed of the same substance as they behaved in the same way upon the application of reagents.

From the colour of the crystals, in conjunction with the fact that the man was taking a preparation of iron at the time, one might at first be inclined to look upon them as consisting of Prussian blue, but the colour of this substance, as is well known, is completely destroyed by potash, which reagent did not exert the slightest effect on the colour of the deposit.

The resemblance in colour of the purple crystals to indigo could not fail to strike any one who had seen specimens of that substance under the microscope. Indeed, with care, crystals of indigo may be prepared which very closely resemble some of the crystals under consideration. (Plate XXXII, fig. 3.) Although the deposit in this case was too small in quantity to permit a careful chemical examination being made, the circumstances above referred to, combined with the description of similar deposits by different authorities, are quite sufficient to justify the conclusion that it was composed of indigo. So far as I know, the microscopical characters of the deposit of indigo have never been figured before. Some of the chief varieties of the crystalline forms are represented in plate XXXII, fig. 4. The pale blue masses are marked *a* in the figure.

This blue deposit is doubtless of the same nature as one observed, many years ago, by Dr. Prout:—"I once met with an instance in which indigo was occasionally voided in the urine, in considerable quantity. The patient was a middle-aged man, of a nervous temperament. He was in the habit of taking seidlitz powders, and the indigo most generally appeared in the urine in the form of a dark blue sediment, after taking one of these powders. The quantity was so considerable on one occasion as to allow of its being collected and examined; when it was found to possess all the properties of indigo, and was obtained in a state of purity by sublimation. I had expected to find it consist of Prussian blue." *

Franz Simon alludes to a case in which the blue deposit was probably of precisely the same nature as the one in the present case. The colour did not disappear upon the addition of caustic potash. Its colour was not destroyed by dilute organic acids nor by hydrochloric acid.†

Indigo-blue or uroglaucine is sometimes precipitated spontaneously by decomposition of the urine.

It is present in small quantity in healthy urine. Heller, however, seems to have obtained it principally from morbid specimens.

The *uroglaucine* or indigo-blue is formed by the decomposition of *uroxanthine*.

Perhaps the best test for this substance is grape-sugar and potash. A little grape-sugar and potash are added to dilute alcohol, and the blue sediment is warmed in the mixture. If indigo be present the fluid loses its blue tint and becomes red. It next soon changes to a green colour.

Uroxanthine is present in small quantities in healthy urine, and in certain diseases of the kidneys and spinal cord may be obtained in considerable proportion. This uroxanthine, which is identical with indican obtained from Isatis tinctoria and some other plants, is readily decomposed into indigo-blue (*uroglaucine*) and indigo-red (*urrohodine*).

Heller obtained uroxanthine by treating urine with acetate of lead, evaporating the filtrate to dryness at a low temperature and extracting the dry residue with ether. The ethereal solution yielded uroxanthine by evaporation. The processes for obtaining uroglaucin and urrohodine are somewhat complicated, and the reader is referred for a description of the best plans to

* On the Nature and Treatment of Stomach and Urinary Diseases. 3rd Edition, 1840.

† Simon's Animal Chemistry, vol. ii, p. 328.

be pursued to Dr. Thudichum's work, pages 331 and 335. Uroglaucine is produced in urine by the decomposition of the uroxanthine, and a blue deposit is formed. Cases in which this substance has been found as a distinct deposit have been reported by several observers. Dr. Hassall has lately investigated the nature of this blue deposit in urine, and has written a very interesting paper on the subject, which is published in the volume of the Phil. Trans. for 1854, page 297.* In this communication the reader will find a statement of what is known upon the subject up to the present time. Some observations on the colouring matters of the urine will also be found in my lectures on urine, urinary deposits, and calculi, now in course of publication in the British Medical Journal (No. CXVIII, April 2nd, p. 271). [L. S. B.]

SARCINÆ VENTRICULI FROM A PATIENT WHO HAD ONLY VOMITED SHORTLY BEFORE DEATH, WHICH WAS CAUSED BY PERFORATION OF THE STOMACH.

THE specimen of vomit was sent to me by my friend Mr. Edwin Day of Acton, in whose practice the case occurred. The vomit contained a pale-brownish sediment, apparently consisting of softened bread which was suspended in a tenacious and almost clear fluid. There seemed to be no tendency to fermentation; sarcinæ were more abundant than I had ever observed before, and a number of torulæ were also present. The great bulk of the brownish sediment was certainly composed of sarcinæ. Mr. Day sent me the following notes of the case.—[Editor.]

"On opening the body an immense quantity of very offensive flatus was evolved, and on touching the stomach it immediately poured out its contents through an aperture below, and a little to the right of the cardiac orifice, so that when she was erect a considerable quantity of the contents would be retained. There was a large quantity of fluid in the cavity of the peritoneum, and some lymph on the various coils of the intestines, but they were not glued together. The liver was pale and small; the heart flabby and easily broken down with the finger; the lungs healthy; the kidneys large; capsule easily detached. The ulcer has the edges bevilled away all round, but there is no thickening. *I could get no history of vomiting.* The patient

* See also The Proceeding of the Royal Society, June 16th, 1853.

has complained for a lengthened period of pain in the side, but appeared pretty well. The day before her death, playing about with the children, and after washing up the tea-things, she was seized with violent pain in the side, and vomited several times. Her mistress applied warm fomentations, and got her to bed. Finding she did not get better, she sent for a practitioner, who was from home. She took a calomel pill and an aperient draught, but experienced no relief. In the morning, after passing a sleepless night, she was seen by a surgeon who ordered her home or to an hospital; but he did not seem to apprehend any sudden danger. I saw her at a quarter to eleven A.M.; she had just been brought home in a cab; and as she was carried up stairs, she fainted. I found her lying on her back, complaining of great pain at the bottom of her stomach, and of thirst. There appeared a swelling there, which I left for future investigation. Her bowels had not been opened for two days; her pulse was weak and slow, and the skin cold and clammy, apparently recovering from the fainting fit. She was ordered to take two tea-spoonfuls of castor oil immediately. In an hour they sent to say she was dead.

"An inquest was of course held. Mr. Wakley the coroner stated, that he had met with several instances in which sudden death had taken place from perforation without previous symptoms, and referred especially to the case of a woman at Hanwell, who swallowed a large German silver fork. For thirteen days she was apparently well;—suddenly seized with violent pain in the stomach, and died in a few hours."

NOTE ON THE PREPARATION OF DIGESTIVE POWDER FROM THE PIG'S STOMACH.

By the Editor.

IN the last number of the Archives (page 269) I described a very simple plan for the preparation of digestive powder from the pig's stomach. I tried some experiments on this subject in the hope of being able to find some simple method which might ensure an efficient preparation, and which at the same time might be readily carried out by persons living in the country. For although efficient preparations are to be obtained, many complaints have been made by practitioners of

the inertness of the pepsine they have employed. In consequence, the remedy has lost its repute to some extent. There are so many cases in which pepsine is of great value that it seems a pity we should be compelled to discontinue its use merely because it is difficult to obtain it good and at a reasonable price.

Digestive powder, prepared in the manner previously described, is now made by Mr. Lloyd Bullock, of Hanover-street. In consequence of the expense of pigs' stomachs, it is still rather costly;* but it is probable that in the course of time it will be supplied at a cheaper rate. It is only reasonable to suppose that the pig's stomach would yield a digestive preparation better adapted to the requirements of the human subject than could be obtained from the stomach of a ruminant.

URINE FROM A CASE OF VERY SEVERE LEPRA.

THE patient was a girl aged 20, who had had previous attacks which had occurred in the spring of several successive years, and had been treated according to several different plans. She first came under my care as an out-patient, but as the case was severe she was admitted into the Hospital under Dr. Johnson. At the present time she is feverish. There is loss of appetite, and some constitutional disturbance. The quantity of scales removed daily from the skin is enormous. A *dust shovel* full is swept from the bed clothes. Large flakes of cuticle, the size of the hand often peel off from the ante-

* Mr. Bullock supplies this at the rate of 2*s.* per drachm. The dose is from 2 to 4 or 5 grains. ·8 grain of this pepsine, with 10 drops of dilute hydrochloric acid, and an ounce of distilled water, dissolve 100 grains of hard-boiled white of egg in from 12 to 24 hours. In the body probably twice this quantity or even more would be dissolved in a comparatively short space of time. It is probable that in a short time the pig's pepsine will be prepared at a much cheaper rate.

Boudault's pepsine is nearly as strong; 1 grain, with the same quantity of hydrochloric acid, dissolves an equal proportion of albumen.

The Viennese pepsine (prepared by Dr. J. Lamatsch) is also very good, but it does not seem to be quite so strong as Boudault's. The same proportion scarcely dissolved a similar amount of albumen in 24 hours.

The digestive power prepared from the pig's stomach retains its activity for any length of time, if kept perfectly dry. I have some which has now been kept in a bottle for upwards of two years, and still retains its active power unimpaired. It is nearly tasteless and inodorous.

Note.—Boudault's pepsine costs about 8*s.* an ounce, and the Viennese about 12*s.* an ounce. One pig's stomach, which costs 6*d.*, yields about 45 grs. of the powder prepared as above described.

rior part of the leg. The skin beneath appears very thin, is bright red, and feels very hot. She passes about 40 ounces of urine in 24 hours; sp. gr. 1021.

Analysis 17. (July 17.)

Water	957·50	
Solid matter	42·50	100·00
Urea	15·00	35·7
Other organic matters ..	6·20	14·7
Fixed salts	21·30	50·7
Chlorides	13·00	30·9

Analysis of the scales. 626 grains were collected in 24 hours. 500 grains subjected to examination.

Analysis 18. (July 21st.)

Water	51·00
Solid matter	449·00
Ash	7·36

A small quantity of the ash was treated with nitric acid. Slight effervescence took place. To the acid solution ammonia was added, and a slight precipitate occurred (phosphate of lime). The ash consisted principally of sulphate of lime with a little phosphate.*

March 2nd. Urine of 24 hours; sp. gr. 1007 neutral.

Analysis 19.

Water	985·40	
Solid matter	14·60	100·00
Urea	5·90	40·40
Uric Acid	·45	3·08
Extractive and ammoniacal salts	·65	4·40
Fixed alkaline salts ..	7·31	50·00
Earthy phosphates ..	·29	1·90
Chlorides	5·00	34·20
Sulphates	·45	3·0

March 23rd. The patient by this time had very much improved.

Analysis 20.

Water	971·3	
Solid matter	28·7	100·00
Urea	10·5	36·58
Extraction	3·6	12·50
Salts	14·6	50·80
Chlorides	7·0	24·3

The large quantity of fixed salts, is, perhaps, the most

* Some time since, I examined the scales from a severe case of lepra (Michael Sheen, aged 24), and found that the dry scales contained 2·31 per cent. of fixed salts, of which the greater part was insoluble in a moderate quantity of water, but upon adding a large bulk a considerable amount was taken up. When this solution was concentrated, *crystals of sulphate of lime* formed.

interesting point shown in these analyses. In healthy urine the solid matter contains about 25 per cent. of saline matter, but in these specimens of urine double that quantity was present. At the same time, the quantity of urine passed was considerable. It would appear also, that the separation of so much organic matter in the shape of cuticle, had caused a diminution in the organic constituents of the urine. In these analyses, the proportion of extractive matters is unusually small. [L.S.B.]

RARE FORM OF TUMOUR BENEATH THE TONGUE OF A GIRL AGED TWENTY-FIVE.

THE tumour projected beneath the chin and extended upwards into the mouth. It had been growing for two years. It was opened by Mr. Fergusson, and about an ounce and a half, of a soft pultaceous mass was removed.

Analysis 21.
1000 grains contained—

Water	838·72
Solid matter	161·28
Extractive matter	13·44
Alkaline salts	·68
Fatty matter	45·00
Tissue, &c., insoluble	99·88
Earthy salts	2·28

The microscopical characters of the tumour were peculiar. These are represented in fig. 1 Plate XXXII. The mass was found to be composed of numerous cells, like adipose vesicles, filled with fatty matter, but some appeared nearly empty, and closely resembled cells of squamous epithelium *a* and *b*. The microscopical characters of this mass somewhat resembled those of cholesteatoma, but no plates of cholesterine were present in the specimen. In structure, however, the contents of this tumour are closely allied to the cholesteatomatous group. [L.S.B.]

LARGE PROPORTION OF FAT IN THE CORTICAL PORTION OF THE KIDNEYS OF LONDON CATS.

THE quantity of fatty matter in the cortical portion of the kidney of London cats is enormous. It has been held that this arose from fatty degeneration resulting from confinement, &c., but all the adult cats' kidneys that I have examined, have exhibited the same peculiarities. It is difficult to refer a change so wide-spread to the results of disease, especially as the cats themselves seem perfectly healthy. The proportion of fat is much greater than is ever obtained from the human kidney in a state of fatty degeneration. As this change is an interesting one, and does not occur to any great extent, until the cat is nearly full grown, I propose in a future communication to give drawings of the microscopical appearances. Now, I only wish to draw attention to the fact of the very large quantity of fat present in the cortical portion of the kidneys of London cats. The eight following specimens were taken as they came, and were not specially selected :—

	22		23		24		25	
Water	72·80		71·10		67·94		73·50	
Solid matter ..	27·20	100·00	28·90	100·00	32·06	100·00	26·50	100·00
Fatty matter ..	8·84	32·5	8·67	30·00	15·39	48·00	8·42	31·78
Animal matter ..	16·90	62·1	19·25	66·60	15·32	47·79	16·65	62·83
Fixed salts ..	1·46	5·4	·98	3·39	1·35	4·21	1·43	5·39

	26		27		28		29	
Water	75·50		78·00		72·00		73·80	
Solid matter ..	26·50	100·00	22·00	100·00	28·00	100·00	26·2	100·00
Fatty matter ..	6·67	25·16	6·95	31·59	12·15	43·39	7·86	30·00
Animal matter ..	18·46	69·68	12·99	59·04	15·29	54·61	15·67	59·80
Fixed salts ..	1·37	5·16	2·06	9·37	·56	2·00	·68	2·59

Analysis.

22	The cortical portion of the kidney of a cat			12 months old
23	„	„	„	15 months „
24	„	„	„	2½ years „
25	„	„	„	18 or 20 months „
26	„	„	„	2½ to 3 years „
27	„	„	„	9 months „
28	„	„	„	2 years „
29	„	„	„	age unknown

It is difficult to ascertain the precise age of the cats, but looking at the results of the analyses generally, we are led to conclude that there is less fatty matter in the cortical portion of the kidney of young, than in that of old cats. Still, many

more analyses must be made before the circumstances under which this increase of fatty matter takes place, can be ascertained. I propose to consider other bearings of this question at an early period.

The following is an analysis of a human kidney in a state of fatty degeneration. The case was that of a girl about 23 years of age, and was in every respect a well-marked instance of the disease. [L. B. v. ii. p. 70.]

Analysis 30.

Water	79·650
Solid matter	20·350
Animal matter	13·436
Fat	5·490
Fixed salts	1·424

The fatty matter of the cortical portion of the cat's kidney consists partly of an oily and partly of a crystalline fat. In one experiment I found 3·46 of crystalline fat, and 4·4 of oily fat. [L.S.B.]

CASE IN WHICH THE SO-CALLED HYDATIDS OF THE PLACENTA WERE DEVELOPED ON THE MEMBRANES AT SOME DISTANCE FROM THAT ORGAN.

By W. H. Michael, Esq., M.R.C.S., Swansea.

THE placenta and membranes in this case were normal, with the exception that at about three and a half inches from the placenta there existed a patch of hydatid like bodies, about the size of the palm of the hand. The vesicles had the usual characters of the so-called *hydatids*, and varied in size from a hempseed to that of a nut. The development of these bodies is probably to be accounted for on the supposition that a few of the villous processes, which at an early period of development completely cover every part of the chorion, had remained in this situation and had been developed into the bodies above described, which, as is well known, are composed of little cysts connected with the villous processes. The position of the mass is shown at *a*, fig. 4, Plate XXX.

PROCESSES AND INSTRUMENTS OF PRACTICAL VALUE IN CARRYING OUT SCIENTIFIC ENQUIRIES BEARING UPON MEDICINE.

THE APHEMETRIC COMPASS;* AN INSTRUMENT FOR MEASURING THE DEGREE OF DISCRIMINATIVE POWER, AS REGARDS CONTACTILE IMPRESSIONS, ENJOYED BY THE SKIN AND MUCOUS MEMBRANES IN CERTAIN AFFECTIONS OF THE NERVOUS SYSTEM.

By John W. Ogle, M.D., Oxon, F.R.C.P.
Assistant Physician to St. George's Hospital, Honorary Secretary to the Pathological Society.

In the year 1834 a pamphlet, consisting of a series of Anatomical and Physiological Annotations "De pulsû, auditû, resorptionê et tactû," was published at Leipsic, by Professor Ernest H. Weber. In one of the chapters, that entitled "De subtilitate tactûs diversâ," &c., page 44, in addition to other sections upon the perception of heat, and the estimation of the weight of bodies by the sense of touch, is one section, headed "Experimenta de distantiâ duorum corporum organon tactûs simul tangentium recte perceptâ," and in this section are several propositions or enunciations, of which three specially and directly bearing on the object of this communication run as follows.

1stly. That various parts of the body are endowed with the faculty, by virtue of the organ of touch, but not in an equal degree, of clearly recognising two substances by which they are simultaneously touched. This degree of endowment may be measured by the exact distance existing between those two substances touching the part; for this is peculiar to the organ of touch, that if it does not distinctly recognise two substances touching the skin at but a slight distance from each other, it will, nevertheless, distinctly recognise them, if this distance between them be increased to a certain limit. (Page 47.)

2ndly. That we perceive the distance and position of two substances by which we are simultaneously touched, more distinctly if they be placed transversely to the axis of the body, than when placed in the longitudinal diameter. (Page 49.)†

* From ἀφή, *i. e.* a touching or close contact; or the sense of touch, as used by Plato and Aretæus.

† This does not hold good for every part of the body.

3dly. That in those parts of the body simultaneously touched, in which the points of the compass touching are clearly recognised, although at no great distance from each other, the distance between them appears to be much greater than in parts not endowed with so exquisite a sense of touch, (*i. e.* with such discriminative power).

This last statement is remarkably well illustrated by Weber, at page 148 of his paper. He says that if the points of a compass, at about the distance from each other, of the breadth of the thumb, be brought into contact (simultaneously) with the skin of the cheek near the ear, the distance existing between them will be recognised as very small, or will perhaps not be perceived at all; but, inasmuch as the anterior part of the cheek enjoys a more subtle sense of touch, and still more the lip, especially the middle portion thereof, if the compasses be gently drawn along the skin towards the middle of the lip, its points, although maintained at the same distance, will appear to become gradually separated, in proportion to their proximity to the lip.

Moreover, the points of the compass brought simultaneously into contact with the skin, in a longitudinal direction, appear to be much closer to each other than if they are placed in a horizontal direction, as respects the axis of the body or the limb (page 151); also, points touching the skin on different sides of the median line, appear to be more distant than when they touch it on one or other side alone. Again, such points seem much more distant, and are more clearly perceived when touching *two* contiguous surfaces subjected to voluntary motion, than when they only touch a *single* one; as is shown by the difference of impression produced, by placing both the points of the compass on one lip, and by placing one point on each of the lips (page 60).

In addition to the above observations regarding tactile discrimination, many others of the highest physiological interest might be quoted from Weber's paper; but as my object here is not to render an analysis of the whole of Weber's tract, but merely to point out such salient points therein met with as may be of a more practical and clinical character, and such as more immediately connect themselves with the purposes to which the instrument which I am about to describe, is applicable, I will forbear to quote further in a direct way from the paper in question.*

* One or two points regarding the details requisite for duly and scientifically carrying out the experiments, may here be timely enjoined. For instance, as Weber observes, great stress must be laid on the fact, that the substances brought into contact with the surface of the body, should, as much as possible, be of the

In the pursuit of his observations, Weber at first made use of an instrument termed in Germany a "*Stangenzirkel,*" consisting of a long and straight piece of steel to which at right angles are attached two moveable points which may be approximated or separated in a straight line. By means of these moveable points, shielded by cork, he ascertained the exact distances or limits within which two distinct cutaneous impressions, made at the same time, are capable or not of being identified. Subsequently he adopted the steel compass of ordinary mathematical use, blunted at the points; and it was with this last instrument, of which my aphemetric compass is a modification, that his observations upon himself and others as to the contactile sensibility and discrimination of the skin were made.

Most of our physiological works give a summary of the results obtained by Weber's instrument as regards this contactile appreciation, etc.,* and therefore it would here be out of place for me to repeat them.† It may suffice to say that at the tip of the tongue and at the palmar surface of the third phalanx of the fingers‡ separate objects or points brought simultaneously into contact with the surface might be identified, having a shorter distance between them than in any other part of the body; and at the above-mentioned part of the tongue, contactile impressions resulting from two applied points, would be distinctly appreciated if on the average only distant from each other about half of a Paris line (*i.e.*, equal to about $\frac{1}{22}$th of an inch, according to English measurement).§ Whereas at the middle of the fore-

same form, material, and temperature. It is of course absolutely necessary, that the two points should be brought into connection with the skin exactly at the same moment of time, for otherwise they will appear to be at a greater distance apart than they really are, and also with equal force and pressure. Also, that the eyes of the person experimented on be closed or averted, and that no cause for distraction of the attention be in any way permitted. For a similar reason, and to prevent confusion between two distinct kinds of cutaneous impression, the points of the object in contact with the skin must not be so sharp as to inflict pain, or so hot or cold as to give the impression of difference of temperature.

* I have ventured to use the epithet "*contactile discrimination,*" substituting it for the expression "tactile sense" of Weber, because we now, I think, more clearly understand the analysis of the so-termed general tactile sense, and recognize its division into the four subordinate tactile senses of, 1st, Temperature; 2nd, Pain; 3rd, Muscular action; and 4th, Contactility, as shown by Landry and others.

† See article "Touch" by Carpenter, in Todd's Cyclopædia of Anatomy and Physiology, p. 1163; also Wagner's "Handwörterbuch" article, Nervenphysiologie, vol ii. p. 568; also Baly's "Translation of Müller's Physiology," vol. i. p. 751.

‡ In some of our authorities it is erroneously stated that Weber found the phalanx of the third finger to be the most highly endowed with this tactile discriminative power; whereas it is the third phalanx of *all* the fingers of which he speaks.

§ Even at this minute distance apart it was at this place quite possible to recognize whether the two points in contact with the surface were placed at right angles to, or parallel with the axis of the body.

arm, thigh, and back, the applied points of the compass must generally, in a natural condition, be 30 lines apart before they can thoroughly be identified.

Weber gives a very elaborate and lengthy as well as a shorter or condensed enumeration of the various parts of the surface of the body, as observed on his own person, with the qualifications possessed by each for the appreciation of double, simultaneously received, contactile impressions.* But, in addition to the examinations by Weber into the above diagnosing properties of the various parts of the skin, researches also have been made into the subject by others, and among them by G. Valentine,† as noticed in Müller's Physiology, and in the above-cited article on "Touch." Valentine, observing on his own person, as well as on that of others, found that great difference existed among different people as to this contactile recognizing power, and this I have myself also found to be the case in observations practised upon healthy individuals. Indeed I think this might be expected, *à priori*, inasmuch as people are naturally endowed with various degrees of general sensibility as regards the perception of all kinds of impressions or sensations, and no doubt the above form of tactile sensation, as well as others, will, in a normal condition, vary in keenness according to what is called the individual temperament, as well as according to education and training respective of the general and inherent perceptive powers; and to a slight degree also no doubt, even according to age, sex, etc. Moreover, the character as to thickness, consistency, &c., of the cuticular covering, doubtless modifies this power of discrimination; and I may here state that I have lately had the opportunity of testing this capacity in the person of a young lady who, owing to her having been for several years disabled as to her hands and feet by rheumatic gout, had always led an indoor life, not being able even to sew; and I found that at the tips of her fingers which were very delicate, soft, and thinly covered by cuticle, she could distinguish the impression made simultaneously by the two points of my aphemetric compass when they were less distant from each other than the nearest impressions which Weber states capable at this part of being distinguished.

* A useful synoptical diagram or chart, as it were, and one which now I am engaged in constructing, might be made of the surface of the whole integument of the body, in which the districts or regions of various contactile discriminative endowment might be mapped out, so that at a glance, and for practical and clinical purposes as alluded to later on, it might be seen how much in any given case of Anæsthesia or Hyperæsthesia this contactile sensation differs from the average acknowledged condition. I hope also to make out to what extent more impressions than two can, at the same time, be discriminated by various parts of the integument at certain stated distances apart.

† De Functionibus Nervorum Cerebralium, &c., 1839, page 118.

Valentin, as may be seen by his tables in which the discriminating power of no less than 50 parts of the surface of the human body is given, found that the same portion of the skin might in some exceptional but healthy cases be so highly endowed as to this power that impressions only separated by one-half the distance of that observed in other individuals could be distinctly perceived; and from a comparison between the native countries of those on whom the experiments were tried, he conceives it possible that climate and method of clothing may become elements in the modification of this discriminating property.

Carpenter also, in his article on "Touch," before alluded to, where distinguishing between this form of tactile discriminative power and what is called common sensibility, has said much with the intention of showing that they are distinct;* and instances the fact that the skin of the face is infinitely more sensitive to a smart blow of the finger or fillip than is that of the ends of the fingers, which greatly exceeds the skin of the face as regards this form of tactile discrimination.† Moreover, Valentin shows that in certain parts, one side of the body is more exquisitely endowed with the discriminating quality than the other, and that the temperature and degree of dryness or moisture of the surface of the skin are also modifying agents.‡ Some

* As regards what is termed general sensibility, no doubt great confusion has hitherto existed in the minds of physiologists, as Landry, in his new and erudite work, "Traité Complet des Paralysies," has demonstrated. That author points out that the cutaneous tactile sensations are not to be put in opposition to general sensibility as an abstract property, for although to be separated from the former, the latter is not an essentially different function, as many would have it, but signifies the mode of feeling extended over almost all the tissues of the body, as regards the vague sensation produced by tactile impressions not capable of furnishing a pure idea of the nature or qualities of the substances causing the impressions.

† Carpenter, as I think, may be inferred from the way in which this illustrative example is mentioned by him, had not arrived at the same conclusions regarding the analysis, so to say, of the tactile sense which Landry has developed. The latter author, whilst ignoring the existence of any substantive or special sense of touch (as may be seen in the results of his researches on tactile sensibility in the Archives Génér. deMedicine, 1852) refers all the tactile phenomena to four primitive, special, and distinct sensations, assignable to separate nervous filaments, and possessing individual and appropriate centres in the great nervous masses, viz., those of temperature, pain, contact and muscular action (*i. e.*, the sensation produced in the muscular tissues by and during their contraction). This being the case, we naturally look for their isolation and independence as well in diseased as in healthy conditions; and are not surprised to meet with instances in which one or other of these sensations alone is preëminently exalted, or diminished, or altogether paralysed in any given portion of the cutaneous or mucous surface.

‡ The tongue and fingers which rank so high as regards contactile discriminative power are less impressionable to temperature than the skin of the eyelids or cheeks, and the extremities of the fingers, so facile in contactile discrimination, are but imperfectly sensitive to painful impressions. Many other

experiments made by Rudolph Wagner* upon tactile discrimination in general, show how very exquisitely this power is possessed by the visual organs. He states that two parallel lines can be distinguished by sight if only 0·00014″ apart; and also cites the observation of Valentin that such lines may be perceived when distant only 0·00009″.

It is impossible here to follow either of these authors more completely where speaking of all the important points connected with contactile discrimination, or the statements of others on the same subject. I will only now briefly allude to three special sources which may be consulted on the subject in question; they are the observations of Dr. Allen Thompson, Dr. Belfield Lefévre, and Dr. Graves.

In the year 1833, Dr. A. Thompson contributed to the Edinburgh Medical and Surgical Journal (see for that year, No. 116) a translation of the account given to him by Weber himself, not then published, of his discoveries concerning the relative power which the skin possesses in various parts, of recognising double impressions made simultaneously upon it within a given limit. In this communication Dr. Thompson combats the supposition maintained by some that this diversity of appreciation was owing to the various parts being more or less habitually seen than others. He shows that this cannot be the cause, inasmuch as some parts which have a comparatively acute discriminative power are quite beyond the range of vision; for example, in the skin over the sacrum and coccyx this discriminative power is more acute than over the pubes. A notable proof of the truth of this objection of Dr. Thompson is the extremely exalted condition of cutaneous sensibility commonly met with in those who have been born blind. Dr. Thompson seems inclined to attribute the diversity in question to some modification of the skin as regards the method of distribution of the nerves, and the quantity of nervous matter existing in divers parts of the skin. The probability of this supposition has however been since quite negatived by the arguments of Dr. Brown-Sèquard.

Again Dr. H. Belfield Lefévre in his "Recherches sur la

instances exist in which the capacity of appreciating impressions of pain, and those of heat or contact co-exist at the same parts in more or less reverse proportions. It is then apparent that the aptitude for, or sensibility to, contact is one totally and radically distinct from sensibility to the sister impressions producing the sense of pain, or changes of temperature, and that it may be estimated altogether apart; hence the positive necessity in attempting very accurate physiological or pathological investigations, of measuring and limiting the degree of all these kinds of sensibility which may or may not be simultaneously affected.

* Handwörterbuch der Physiologie, Bd. ii., page 568.

Nature, la Distribution, et l'Organe du Sens Tactile," 1837, an interesting pamphlet in which he seeks to establish the nature of the contactile sense and the relative value of the different parts of the skin as an organ of the sense of contact, as also the philosophical and functional anatomy of this organ, has several propositions regarding this discriminative power. Among other things worthy of notice in this work he makes use of a very felicitous expression regarding the discriminative power, and one which if adopted would save much periphrasis. Alluding to the variable distances at which two points touching the skin are perceived to be clearly distinct, and at which they give rise to but a single impression, he applies the terms "limit of distinction" and "limit of confusion" respectively. He shows very clearly that the faculty of perceiving delicate differences of temperature is especially situated in the integument of the face, and that in this respect the skin of the jaws, eyelids and olecranon is much more delicate than the skin of the tongue, lips and extremities of the fingers, which latter parts are however the most highly endowed with contactile discriminative power.

Dr. Graves, of Dublin, also had a paper in the New Philosophical Journal of Edinburgh, in 1836, on the sense of touch, with an analysis of Weber's labours on that subject.

The above brief observations regarding certain facts connected with tactile sensations will suffice I hope to show how interesting the subject, as now considered, is in a physiological aspect; and it might readily have been anticipated that their discovery would ere long be utilized and turned to some practical purpose, which has proved to be the case. Those who may advert to the proceedings of the Société de Biologie at Paris, to our Medico-Chirurgical Review in London, and to the Journal de Physiologie, by Brown-Sèquard, will find that the laws concerning contactile discrimination first evolved by Weber,* and in some points more fully brought out and elaborated by later observers have been applied as methods of detecting and measuring various degrees of contactile anæsthesia or hyperæsthesia in diseased conditions for the purposes of diagnosis or prognosis.

Dr. Brown-Sèquard was the first to make this adaptation. In the first volume of the "Comptes rendus des Séances de la Société de Biologie," page 162, will be seen a communication by

* Landry supposes the diversity shown by different parts of the surface of the body in respect of the contactile sensibility, to be rather a manifestation or expression as it were, of the degree of perfection of the tactile organs than of an inequality in the distribution of the sensibility; being, in fact, an indication of tactile preponderance or intensity, so to say.

him entitled "Recherches sur un moyen de mesurer l'Anæsthésie et l'Hyperæsthésie," wherein he relates the particulars of eleven clinical cases in which by means of a pair of ordinary mathematical two-legged compasses, a deficiency, or an exaltation of contactile discriminative power in the forearm and legs was carefully ascertained and measured. In one case, although the two points in contact with the skin were 10, 15 and 20 centimetres apart, yet the sensation perceived was that of a single point only. In one case of paraplegia the two points applied simultaneously to the feet were distinctly appreciated when only separated to the extent of 5 millimetres (the limit of distinction being here from 20 to 25 millimetres). In this case sensibility to pain was also exaggerated. Again at page 280 of the 41st number (January 1858) of the British and Foreign Medico-Chirurgical Review is the description of an ingenious instrument called the "æsthesiometer," and contrived by Dr. Sieveking for measuring the nearest distance at which two points made to impinge upon the skin in certain cases of paralysis, give a two-fold impression. This is accompanied by one or two cases showing the utility of the instrument,* and by a drawing from which it appears that it is not very dissimilar to the instrument the "Stangenzirkle" used in his physiological researches on the tactile sensations by Weber in the first instance, as alluded to above (page 323).

Similar also in principle to this one of Dr. Sieveking's is another instrument for the same purpose used by Dr. Brown-Sèquard, and described and figured by that physiologist at page 346 of the first volume of his Journal de Physiologie, 1858. This latter instrument differs from that of Dr. Sieveking in having a longer handle, so that, as Brown-Sèquard thinks, greater facility for application and for the *simultaneous* contact of the two points, so absolutely necessary, with the cutaneous surface is permitted.

It occurred to me that several advantages would arise if an instrument could be constructed combining the principle of the beam-compass with that of the so-called mathematical one; and accordingly I had one fabricated which has appeared to me to answer the desired purpose.†

* At page 504 of No. 45 of the same journal Dr. Sieveking gives a striking additional case, exemplifying the use of the instrument; showing the difference in the power of the skin, between the discrimination of painful impressions and that of merely contactile ones.

† It was made for me by the well known firm of Messrs. Elliott and Co., instrument makers, Charing Cross, London, whose foreman Mr. Becker, after learning the principle on which I desired the instrument to be constructed, supplied all the calculations, &c., involved in the delicate graduation of the dial-plate, &c.

Description of the Aphemetric Compass.—The instrument, which is about 4½ inches in length, consists of a pair of mathematical compasses with the usual joint, furnished with a circular dial-plate, whose circumference is divided into inches and tenths and twentieths of an inch, and provided with a central hand or indicator (Fig. 46, 1), which may be moved in any direction, so as to point to the various subdivisions. This dial is attached to the anterior surface of one of the legs of the compass, and the indicator on its face is moved by means of a small wheeled pinion behind the dial, of which the pivot is connected with it through the dial. Into this wheeled pinion (*b*) behind the dial works a segment of a tooth-wheel (*c*), which is attached to the other leg of the compass in such a manner that when the legs are separated, that is when the compass is opened, the tooth-wheel working in the pinion moves the indicator on the face of the dial and makes it point to the various subdivisions.

FIG. 46.

1.

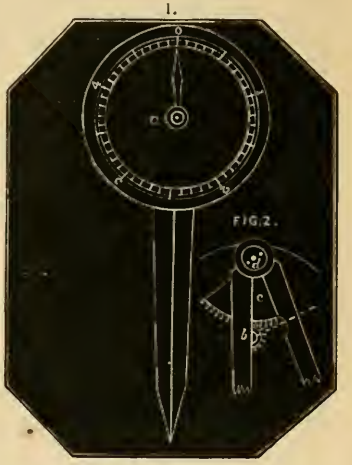


Fig. 46.—1. Shows the front view of the graduated dial-plate, with the indicator.
2. Shows the posterior view, with the tooth-wheel working in the wheeled pinion.

Thus, as these subdivisions are calculated and constructed with reference to the fact that the legs of the compass open round a centre, and not in a straight line, (and consequently are not made equal) the exact distance at which the points of the compass are separated may at once be "read off" on the graduated face of the dial-plate.

In manipulating with this instrument the readiness of measurement, owing to the great length of the graduations on the dial-plate and the quickness with which the corresponding distances* between the separated points of the compass are registered on the dial are at once apparent.

Moreover, the handling of the instrument, owing to the ease with which the two legs can, with one hand, be drawn

* The intervals on the dial-plate between the degrees or various marking lines of division will of course be found, on observation, to be much larger than the space between the points of the compass when opened and separated to a given amount, which each one expresses.

from each other, whilst at the same time the distances between them are simultaneously and clearly indicated (a process which greatly aids rapid observation) is preëminently convenient. Again, its value is enhanced by the fact that it may be used much more freely than the instruments (formed of a straight piece of metal) already spoken of for measuring contactile discriminative power, in the measurement about the joints, or wrists, or feet, where an irregularity or considerable convexity of the surface obtains. I must allow that, as regards its application, the instrument which I had made does not quite possess sufficient range of measuring power, as it is not quite able to measure five inches of the surface; but of course this defect is easily remedied in future instruments of the kind.*

In conclusion, I cannot help saying, that although the application of Professor Weber's physiological discovery to clinical and pathological purposes is most admirable and interesting, yet it has not been found by me to be so very extensively practical as might have been supposed. I have made use of it as a means of diagnosis in very many instances, which I need not now detail, and in numerous cases, owing to the peculiar mental condition attendant upon the cause of the sensory paralysis which was under investigation, I have found that the perceptions and the statements of the patient could not be at all considered trustworthy. The complication of intellectual weakness with the pathological interference as regards sensory and motor paralysis, and the natural obtuseness when in health, and want of habit, in attending precisely to any sensations whatever, or in explaining any sensations of which the mind may be cognisant, met with so often, especially among hospital patients, have not infrequently rendered this mode of diagnosis and prognosis by means of the aphemetrical compass perfectly nugatory. Add to this

* I have given to this instrument the name aphemetric compass, rather than the neater and more euphonious one of æsthesiometer, inasmuch as I was desirous that its designation should be one carrying its own meaning with it as much as possible. The word æsthesiometer would of course apply to an instrument intended to measure the degree of any kind of sensation whatever, whereas the title "*aphemetric compass*" only has reference to the sense of contact, and in a more accurate way than æsthesiometer indicates the use and application of this instrument.

This instrument obtains favour also, I was glad to find, with others than physiologists and physicians. One skilled in mechanics and mathematical appliances spoke in a highly favourable way of its future use for quickly and accurately reducing geometrical distances in the construction of plans, engineering diagrams, &c.; and of its serving, in a superior manner, the purpose of the calipers in ordinary use.

Perhaps, if the limbs of the compass were somewhat arched, this intention of geometrical mensuration would, by making it useful in the case of solid bodies, &c., render it still more generally applicable.

also the extreme necessity for precautionary measures in the use of the instrument, as before stated, and the obstacles likely to arise from the differences normally found as regards contactile sensibility in different people, which moreover may also exist in the same individuals as regards different parts of their skin, and it will be easy to conceive the existence of cases in which anything like an accurate and reliable measurement of this discriminative power becomes futile.

The qualifying observations I am induced to offer, lest others might be inclined to place too high a value upon a comparatively novel application to clinical medicine of a physiological fact which nevertheless undoubtedly possesses great practical importance.

ON THE PRESERVATION OF URINARY DEPOSITS AS PERMANENT MICROSCOPIC OBJECTS.

By Lionel S. Beale, M.B., F.R.S.

Of late years the practical importance, in many cases of disease, of recognising the nature of different substances forming urinary deposits has been strongly felt, and a desire has been generally expressed that a series of the most important might be kept on sale, so that practitioners might have an opportunity of readily obtaining named specimens, with which deposits that from time to time fall under their notice might be compared, and their nature recognised. Persons who prepare and sell microscopic objects have found great difficulty in preserving urinary deposits satisfactorily, and many specimens that have been purchased have been found to lose their characters after a few months, and have soon become quite useless objects. Feeling strongly the real practical value of preparations of this kind, it seems to me very desirable that a few rules with regard to the preservation of urinary deposits should be laid down, and I therefore propose in this communication to describe the different plans which I have found to succeed best. I hope that, shortly, there will be no difficulty in obtaining well-mounted and illustrative series of specimens.* At the same

* Specimens of urinary deposits may be obtained of Messrs. Smith and Beck, Coleman Street, City; Mr. Tennant, 149, Strand; and Mr. Matthews, Surgical Instrument Maker, Carey Street, Lincoln's Inn Fields, who has now in stock several series of excellent preparations.

time any one attending Hospital practice, who has a little time at his disposal, can, without much trouble, prepare such preparations for himself.

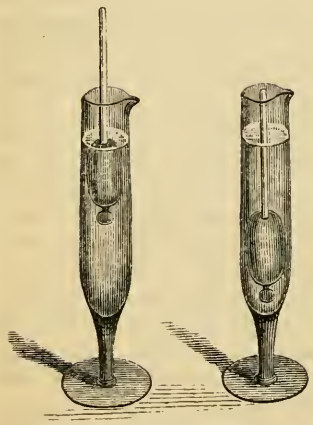
The different characters of urinary deposits render necessary different plans of preservation. It is, therefore, desirable to consider the nature of the deposit before we attempt to preserve it. Some deposits may be preserved *dry*, others may be mounted in *Canada balsam*. A certain number exhibit their characters very well if preserved in *glycerine*, while many can only be kept in certain *aqueous fluids*. For the convenience of description I have divided deposits into three classes :—

1. Light and flocculent deposits.
2. Dense and opaque deposits.
3. Granular and crystalline deposits which occupy a very small bulk

In alluding to the methods of preservation it will be well to adhere to this division.*

Of separating the deposit from the urine, and of placing it in the preservative fluid.—After the deposit has been allowed to settle in a conical glass the supernatant fluid is to be poured off,

Fig. 47.



Glasses for collecting deposits and for taking the specific gravity of fluids.

Fig. 48.

Conical glass for allowing deposits to subside.

and if it is to be mounted *in fluid* a quantity of the preservative solution, equal in bulk to the urine and deposit that remains,

* The Microscope in its application to Practical Medicine. 2nd Edition page 301.

is to be added. After the deposit has again settled, the fluid is to be poured off and replaced with an equal portion of fresh preservative solution. In this way the deposit is washed clean and properly impregnated with the preservative fluid.

When preparations are to be preserved in a fluid medium, a small shallow water-tight cell is to be used. The specimen and its preservative fluid being placed in the cell, the thin glass is applied and the cover cemented in its place with the aid of Brunswick black or other cement.* In washing urinary deposits prior to mounting them, it is often necessary to add some compound to the water used for this purpose in which they are known to be insoluble, and sometimes it is necessary to add some substance to increase the density of the fluid, for which purpose certain salts, syrup, or glycerine may be employed, according to circumstances. Many deposits, although soluble to some extent in pure water, are quite insoluble in a weak acid, others are insoluble in a weak alkali or in certain saline solutions. Again, it is sometimes desirable to separate certain substances in the deposit from others, and this may be effected by special chemical solutions which have the power of acting on the one and not upon the other; or, in cases where one is more dense than the other, by agitating the deposit with water, and, after allowing time for the heavier one to settle, pouring off the lighter one into another vessel to subside there. From this it may be collected in the usual way.

Fig. 49.

Thin glass cell for mounting thin preparations in fluid.

If the preparation is to be preserved as a *dry object*, water is to be added in the first place, and a portion of the deposit which has thus been carefully washed, is to be removed with the aid of a pipette to the glass slide, and the fluid allowed to evaporate, the whole being covered by a bell-jar over a dish of strong sulphuric acid. When dry it is to be protected from dust by a thin glass cover. The glass cover is easily prevented from pressing upon the preparation by interposing a thin piece of paper or cardboard; or a thin India-rubber ring, which may be easily fixed to the glass slide and thin glass cover, by a little gum made into a thick paste with whiting, may be used.

If the specimen is to be mounted in *Canada balsam* or turpentine, it is to be dried in the manner just described, warmed

* How to work with the Microscope.

slightly, wetted with the balsam, and mounted with the usual precautions.*

The appearance of objects in the microscope depends very much upon the medium in which they are immersed, and many structures are so altered in their character by different media that they would hardly be recognised as the same object. It may be said generally that the darker the object and the more dense its structure, the higher should be the refractive power of the medium in which it is mounted,—thus the dark coloured uric acid, or the thick spherical crystals of carbonate of lime, and the dumb-bells of oxalate of lime, exhibit their structure to the greatest advantage when mounted in the highly refracting *Canada balsam,* or in *strong syrup* or *glycerine,* while the beautifully transparent octohedra oxalate of lime would be scarcely visible in these media, and require to be mounted in an aqueous fluid which possesses a lower degree of refractive power. Many of these objects, when mounted dry, appear quite dark and scarcely exhibit any structure at all, in consequence of great difference in the refracting power of their substance, and the air by which they are surrounded. From these remarks it will be evident how important it is to examine the same object in different media, in fact it is quite impossible to form an idea of the real structure of many specimens without proceeding in this manner.†

Media in which urinary deposits may be preserved.—Urinary deposits may be mounted in *air,* in *turpentine, oil,* or *Canada balsam;* in *glycerine,* in *gelatine and glycerine,* in *solution of naphtha and creosote,* in *certain saline solutions,* in *weak spirit,* and in some other aqueous solutions which will be alluded to. The '*glycerine*' alluded to in this paper is *Price's patent glycerine.*

Extraneous matter.—I have dwelt at some length upon the importance of the microscopical observer making himself quite familiar with the appearance of all objects which are likely to fall into the urine accidentally, and I strongly recommend every one to be provided with specimens of these, mounted in an *aqueous fluid.*‡ The naphtha and creosote solution answers best, but a weak solution of glycerine may be employed. The tendency of glycerine, by its high refractive power, to render substances immersed in it unusually transparent, must be care-

* How to work with the Microscope.

† On this subject the reader is referred to "How to work with the Microscope," p. 59, and "The Microscopic in its application to Practical Medicine," 2nd Edition, §§ 74, 89, 90.

‡ Microscopical Journal, No. II, p. 93.

fully borne in mind. Objects put up in this preservative solution would present a very different appearance if they had been immersed in the urine, and on these grounds it is objectionable. The naphtha and creosote solution is perfectly transparent, and is not liable to this objection.*

The extraneous matters, with the characters of which every physician who uses the microscope should be familiar, are the following :—

Human hair.	Feathers.	Wheat starch.
Blanket hair.	Tea leaves.	Testa of wheat.
Cat's hair.	Fibres of deal from the floor.	Cells of potato in which the starch is lodged.
Flax fibres.	Potato starch.	Air bubbles.
Breadcrumbs.	Rice starch.	Oil globules.
Cotton fibres.		

The microscopical characters of these are figured in the "Illustrations of Urine, Urinary Deposits, and Calculi," Plates I. II. and III, figs. 1 to 16.

Of keeping a quantity of the urinary deposit for subsequent inquiries.—In cases where it is desirable to retain a certain quantity of the deposit in the preservative solution for subsequent examination, or for the purpose of making more preparations, it should be kept in a small glass tube with a tight-fitting cork, and carefully labelled. Most urinary deposits may be kept for a longer time in this manner, than mounted in thin cells. I propose now to describe briefly the various plans adapted for the preservation of urinary deposits that have been found to succeed best.

* The composition of this fluid is as follows:

Solution of Naphtha and Creosote.

Creosote..	3 drachms.
Wood naphtha	6 ounces.
Distilled water	64 ounces.
Chalk, as much as may be necessary.	

Mix first the naphtha and creosote, then add as much prepared chalk as may be sufficient to form a smooth thick paste; afterwards add, very gradually, a small quantity of the water, which must be well mixed with the other ingredients in a mortar. Add two or three small lumps of camphor, and allow the mixture to stand in a lightly-covered vessel for a fortnight or three weeks, with occasional stirring. The almost clear supernatant fluid may then be poured off and filtered if necessary. It should be kept in well-corked or stoppered bottles.

I have some large preparations which have been preserved in upwards of a pint of this fluid, for more than seven years, and the fluid is now perfectly clear and colourless. Some dissections of the nervous systems of insects have kept excellently; the nerves retain their white appearance, and have not become at all brittle. Two or three morbid specimens are also in an excellent state of preservation, the colour being to a great extent preserved, and the soft character of the texture remaining. I have one preparation mounted in a large gutta percha cell, containing nearly a gallon of this fluid.

First Class of Urinary Deposits.

Mucus.—It is very difficult to preserve the character of the so-called "mucus corpuscles," or imperfectly formed epithelial cells, nuclei, and granules, which constitute the slight flocculent deposit met with in healthy urine, and termed "mucus." The naphtha and creosote solution is best adapted for the purpose, and it is desirable to place the specimen in a cell about the twentieth of an inch in depth.

Epithelium.—The different varieties of epithelium are easily preserved, although, after the lapse of some time, minute oil globules make their appearance in them. They may be kept in naphtha and creosote fluid, to which one-fourth of its bulk of glycerine has been added. It is well to put up specimens of epithelium from the urethra, bladder, ureter, and pelvis of the kidney, removed from the organs of a healthy man who has been killed accidentally. They should be mounted in very thin cells. Specimens of the epithelium from the vagina, which can generally be obtained from the urine of females, should also be preserved.

Vegetable Growths—Fungi.—I have found that fungi may be preserved most satisfactorily in glycerine, for although they appear somewhat more transparent in this fluid than in urine, they preserve their general character better than when immersed in other preservative fluids. It is necessary to add weak glycerine in the first instance, and to increase the strength gradually, otherwise the fungi become collapsed, owing to the great density of the strong solution. A solution composed of equal parts of water and Price's glycerine is sufficiently strong to preserve fungi. I have not been able to preserve specimens of sarcinæ which I have met with on two or three occasions in the urine, probably in consequence of their extreme delicacy. The sarcinæ which are from time to time met with in vomit keep perfectly well, and preserve their recent characters in glycerine.

Spermatozoa are sometimes mounted in the dry way, but although their general form is preserved, their refractive power and transparent appearance are so different from what is observed when they are immersed in urine, that little is gained from such preparations. Spermatozoa keep very well in glycerine, although they appear rather more faint than in an aqueous fluid. They should be examined with the *eighth of an inch object-glass* (× about 400), but when the eye of the observer has become familiar with the general appearances, they may be

readily recognised with a quarter of an inch object-glass (× about 200).

Casts.—It is not difficult to preserve the character of some varieties of casts. The transparent casts often become covered with numerous minute granules and oil globules, and their character much altered. Granular casts and epithelial casts often keep very well in the naphtha and creosote solution, but altogether I prefer glycerine, with one-third part of water. Although in many instances the cells they contain are altered, and oil globules appear much more transparent than when in urine, this alteration in character may be easily allowed for. I have some specimens of large waxy casts and epithelial casts which have been kept in the naphtha and creosote solution for upwards of seven years, and still preserve their characters well. The specimens in glycerine, of course, keep admirably. Some casts may also be preserved in gelatine and glycerine, care being taken that the mixture is not made too hot.

Second Class of Urinary Deposits.

Pus.—Recent specimens of pus may be so readily obtained that it is hardly necessary to attempt to preserve the corpuscles permanently. Their characters alter so much in all the preservative fluids that I have tried, that after they have been put up for some time it would be difficult to recognise the nature of the preparation.*

Phosphates.—The phosphate of lime, in its amorphous form, in globules, and minute dumb-bells, is easily preserved in weak spirit, naphtha and creosote fluid, or glycerine, but the character of the crystals of the triple, or ammoniaco-magnesian phosphate, could not be retained in this solution. As is well known, this salt is quite insoluble in solutions of ammoniacal salts, and these make the best preservative solutions for it. Crystals of triple phosphate may be kept for any length of time, with their smooth surfaces and their lustre unimpaired, in distilled water, to which a little chloride of ammonium has been added. Phosphate of lime and the stellar form of triple phosphate may be dried carefully, and mounted in Canada balsam, but, of course, the appearance of the crystals is a good deal altered.

Urates.—As the urates are so commonly met with, and as they are generally deposited in the form of granules, there is scarcely

* Dr. Andrew Clarke speaks highly of some fluids which he has prepared, containing bichloride of mercury and arsenious acid.—"The Microscope in its application to Practical Medicine." 2nd Edition p. 237, note.

any need of mounting them as permanent objects. If desired, however, deposits of this kind may be preserved by adding a little naphtha and creosote fluid to the deposit which should be left in it for a considerable time before it is put up. Urates which crystallize in small spherical masses, as often occur in the urine of children, and more rarely in irregularly branched processes, may be preserved very well in Canada balsam, or if preferred, they may be kept in the naphtha and creosote fluid.

Third Class of Urinary Deposits.

Blood Corpuscles become more or less altered in most preservative fluids. I think that those which I have mounted in glycerine (one part glycerine to two parts of water) have undergone the least change.

Uric Acid crystals are easily preserved as permanent objects. The usual plan is to mount them in Canada balsam. They should be washed, in the first instance, with a little water to which a few drops of acetic acid have been added. When pretty clean, they may be placed upon a glass slide, with the aid of a pipette, and the greater quantity of the fluid absorbed with a small piece of bibulous paper. After the crystals have been properly arranged on the slide with a needle, they may be dried, by exposure under a bell jar over a dish containing sulphuric acid. When quite dry, they may be moistened with a drop of turpentine and mounted in Canada balsam. In this operation a very slight excess of heat should be employed, otherwise the crystals will become cracked in all directions, and more or less opaque. Uric acid crystals, as a general rule, do not keep well in glycerine. In cases where we wish to preserve other substances in the deposit as well as uric acid crystals, the naphtha and creosote fluid will be found to answer very well. I have some preparations mounted in this manner which were put up six or seven years ago.

Cystine.—Crystals of cystine may be preserved in Canada balsam, the same care being taken in mounting them as mentioned under uric acid, or they may be kept very well in distilled water, or in the naphtha and creosote fluid, to which a little acetic acid has been added.

Oxalate of Lime.—Both the octohedra and dumb-bells may be preserved in glycerine, but the former look very transparent in that fluid. The dumb-bells may also be mounted in Canada balsam, but in this medium the octohedra are almost invisible. When required for polarizing they should be put up in balsam. The dumb-bells keep very well in glycerine.

On Preserving Crystalline Compounds obtained from Urine.

It is exceedingly difficult to preserve many of the crystalline substances obtained from urine in a moist state, but several of them form beautiful microscopic objects when carefully dried—*Urea, nitrate of urea, oxalate of urea, creatine, creatinine, alloxan, hippuric acid, murexid,* and many others may be kept as permanent objects in this manner. In order to prepare them, it is better to cause them to crystallize upon a glass slide; allow the mother liquor to drain of, and immdiately place the slide under a bell-jar over sulphuric acid. Sometimes the crystals may be made in a small evaporating basin, and when drained and dried, a portion of them may be removed to a glass cell and covered with a piece of thin glass to exclude the dust. Many crystals may be examined and preserved for a considerable time in their own mother liquor, especially when they are very slightly soluble in fliud, but as a general rule this plan does not answer very satisfactorily, for, independently of the escape of the fluid from the edges of the cell, a few of the largest crystals grow still larger at the expense of the smaller ones, and the beauty of the specimen is destroyed. The different forms of these crystals, as they appear in the microscope, are given in the "Illustrations of Urine, Urinary Deposits, and Calculi." Urine, plates I to IX. See also "The Microscope in its application to practical medicine," chapter ix., page 292.

ON THE USE OF VULCANITE INDIA RUBBER FOR MAKING CELLS.

"I HAVE lately been strongly impressed with the great value of Vulcanite India Rubber, for making cells, of any size or depth, for mounting objects in fluid. It may be obtained in sheets, and the centre turned out in a lathe, just as easily as if it were a piece of ebony. It is extremely hard, takes a beautiful polish, and is not acted upon by any of the solutions ordinarily used for the preservation of animal or vegetable tissues. An intense heat is requisite to make any impression on it, so that the cells may be fastened to the glass

slide with marine glue. You will find no difficulty in procuring it in town; for it is, I believe, now much used for brush-handles and other purposes, instead of ebony, which it closely resembles in appearance. Any turner can make some dozen cells in an hour, and being so much cheaper than glass, especially when very large cells are required, I have no doubt that, when known, it will be extensively employed by all microscopists. I send you one that you may judge for yourself. The Vulcanite India Rubber is sold by Goodyear and Son, No. 47, Leicester-square, and can be obtained in sheets of any thickness."—Extract from a letter from the Rev. G. S. B. Isbell, Bath.

COMPRESSORIUM FOR PRESSING DOWN THE THIN GLASS COVER WHILE CEMENTS OR CANADA BALSAM ARE DRYING.

By the Rev. G. S. B. Isbell, Bath.

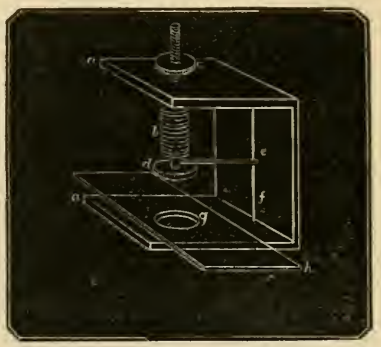
THIS little apparatus is intended to press down the glass cover of microscopic objects while the cement or balsam is hardening, so as to keep the objects in their place, and to prevent them from curling up, which often causes much difficulty in preserving them. This I have found not unfrequently to occur in mounting sections of horny and other tissues, which should present a perfectly flat surface for examination. The frame of the Compressorium is made of brass, bent at right angles, to form an open square, or it may be in the form of the letter C, only having the lower part flattened, to give it a firm base. It should be not less than an inch and a half in depth and breadth, to admit cells of a large size.

Through the upper arm passes a screw, about one-eighth of an inch in diameter, with a tolerably strong and elastic spiral wire-spring surrounding it. A disc of cork is cemented to one end to press on the covering glass, and a nut works on the other end above the arm, by means of which the disc can be raised or depressed. A circular aperture is made in the lower arm or base, so that the object which is placed upon it may be examined if required. It is desirable to have a narrow piece of brass, soldered to the screw, just above the disc, with a hole in it, through which passes a wire attached to the upper and

lower arm, to keep the disc from turning round in its ascent and descent. This, however, is not absolutely necessary, as it can be held between the finger and the thumb until it is sufficiently pressed on the covering glass of the object properly arranged over the circular aperture.

The following sketch will make this description more intelligible.

Fig. 50.



a The brass frame.
b The screw and spiral spring.
c The nut to elevate and depress the cork disc, and to regulate the amount of pressure.
d The disc.
e The brass bar through which passes the wire (*f*) to steady the disc.
g The circular aperture.
h The slide carrying the object, properly arranged over the aperture

I gave the design of this Compressorium to Mr. Heath, Optician, Fore-street, Devonport, who made one for me, and has, I find, constructed some for sale, to hold several slides.

REPORTS OF RESEARCHES PUBLISHED ELSEWHERE.

CONTRIBUTIONS TO THE PATHOLOGY OF ICTERUS.

By Dr. W. Kühne.

From "Virchow's Archiv," 3rd and 4th Part of 14th Vol. September, 1858.

(Abstract by George Scott, M.D.)

ICTERUS, a term comprehending a group of diseases characterized by yellow colour of the skin and some of the secretions, is, in the majority of cases, caused by obstruction of the flow of bile into the intestine. For a long time past, it has been held that no change occurs in the activity of the liver under these circumstances, and that the bile continues always to be secreted, being afterwards partly deposited in the skin, and partly excreted by the urine. This idea was confirmed by the absence of the colouring matter of the bile in the fæces, and the presence of the same in the skin and urine. After, however, the bile began to be examined chemically, and it was discovered that the colouring-matter, as regards weight, was its most unimportant constituent, and that the greater part of this secretion consisted of other substances before described as bile-resins, the urine was submitted to chemical analysis instead of to mere observation.

Thénard and Orfila were the first who thought that they detected the resinous constituents of the bile in icteric urine. It was not, however, until Strecker discovered that the bile was a solution of alkaline salts of two coupled acids that the science of chemistry was far enough advanced to afford any certain results in the investigation of the pathology of icterus. These bile-acids form, with their combinations and derivatives, a chain of substances so well characterized, that the secretion of the liver can be easily detected, even under pathological conditions. Pettinkoffer's test has given to the chemist a means of detecting with certainty, quantities of bile-acids too small for elementary analysis.

Notwithstanding that the detection of bile-acids was no longer difficult, yet, curiously enough, there is scarcely a

subject upon which chemists and physiologists have been more at variance than upon the question of the presence or absence of bile-acids in the urine.

Lehmann considers that the existence of bile-acids in the urine is an extremely rare occurrence, and that it is just the deeply coloured urine of icteric people which contains no bile-acids.

Gorup-Besanez and Scherer have come to the same conclusion. Frerichs and Staedeler aver that bile-colouring matter and bile-acids *never* appear together in the urine; that, on the other hand, sometimes traces of the biliary acids can be detected in urine having no jaundiced hue; hence they conclude that there is some connection in the origin of these two substances. The following experiment seemed to confirm this:—Frerichs injected into the veins of a dog ox-bile completely freed from mucus and colouring-matter. The animal's urine afterwards secreted was extraordinarily deeply coloured, and chemical analysis showed that in reality bile-colouring-matter was present in the urine as a sediment. Substances giving the Pettinkoffer reaction were not detected. Hence Frerichs concluded that so soon as bile-acids arrived in the blood, they were changed into bile-colouring-matter. This hypothesis seemed to be confirmed by the artificial formation of bile-colouring-matter out of glycocholate and taurocholate of soda.* If, in fact, one of these salts be digested for a long time, at an ordinary temperature, with concentrated sulphuric acid, the solution assumes gradually several different colours, and, after a certain time, on the addition of water, a flaky precipitate can be produced similar, in many respects, to bile-colouring-matter. Frerichs has confirmed the correctness of the above experiments by frequent repetitions.

Kühne, however, does not agree with Frerichs that the bile-acids are changed into bile-colouring-matter in the blood, for if so, after injecting 3-5 grammes of bile-acid salts into the blood, the urine afterwards secreted would not have the usual icteric colour, but would be perfectly black; and, in a jaundiced person, when bile-acids do not pass off by the normal routes, the colour of the skin would become perfectly black in a short time. This theory of Frerichs has, however, not been called in question, because bile-acids have not hitherto been demonstrated as an integral part of icteric urine. Kühne attributes this latter circumstance to the insufficiency of the tests which have been, up to the present time, employed for the purpose.

* *Glycocholic* and *cholic* acids are synonymous; also, *taurocholic* and *choleic* acids.

Dr. Felix Hoppe has communicated, in the thirteenth volume of "Virchow's Archiv," a new method of detecting with great certainty any quantity of bile-acids in the urine. This method is as follows:—

Decompose the icteric urine to be examined with an excess of milk of lime, and then boil for about half an hour; filter; evaporate the filtered fluid nearly to dryness; decompose with a great excess of concentrated hydrochloric acid, and then keep the whole, before being filtered, at the boiling point for half an hour. To avoid spurting of the fluid, it is necessary to renew the volatilized hydrochloric acid from time to time. Leave the liquid to get completely cold, and then add six to eight times its volume of water. Filter the dark brown turbid solution thus obtained, wash out with water the residue on the filter until the same runs through quite colourless; dissolve the brown resinous mass on the filter in 90 per cent. alcohol; decolorize by boiling with animal charcoal, filter, and evaporate to dryness in the water-bath; the residue is a yellow, resinous mass, which, if bile-acids be present, must consist for the most part, of pure choloidic acid. In such a case it melts by warming and emits the peculiar musk or soap-odour. Lastly, dissolve in a very little caustic soda and some drops of warm water, add a very small piece of sugar, and allow three drops of concentrated SO_3 slowly to fall into it. At first the fluid becomes milky and troubled, and resinous flakes separate which stick pertinaciously to the glass, but afterwards, by the addition of more SO_3, these again dissolve and produce a beautiful purple-red or dark violet fluid.

In icterus caused by closure of the ductus communis choledochus, the urine contains always bile-acids as well as bile-colouring matter.

Kühne examined five litres of *normal* urine for bile-acids, after Hoppe's method, but did not detect any; he, therefore, concludes that the presence of *bile-acids* is a peculiarity of only icteric urine.

Kühne found in one case that, when carbonate of soda, and at the same time glycocholate of soda, were injected into the veins of a dog, the urine contained, besides the hippurate of soda, *carbonic-acid* salts. This urine gave directly no Pettenkoffer's reaction with sugar and SO_3, and, as it was not examined for bile-acids by Hoppe's method, Kühne supposed that the cholalate of soda formed in the body during the course of this experiment may have been changed, by oxydation, into carbonate of soda. On frequent repetition of the experiment, however, the carbonic acid salts were as often absent as present in the urine,

and when the latter was examined for bile-acids by Hoppe's method, cholalic-acid was *invariably* found undecomposed in that fluid. Hence the assumption that the carbonic acid salts which sometimes appeared in the urine in these cases, were formed by the oxydation of the cholalic acid salts, is not tenable, and Kühne is quite unable to account for their casual occurrence.

Some experiments were then made upon the use of benzoic acid during icterus, and it was found that in this disease, after the use of benzoic acid, or its alkaline salts, *no hippuric acid*, but *unchanged benzoic acid* was excreted with the urine. Without doubt this seems to indicate some modification in the function of the liver coming on so soon as the bile cannot find its way without impediment into the intestine. As is known, the mere presence of glycin, either free or as a constituent of glycocholic acid, in the blood, is sufficient to change the benzoic acid arriving in that fluid into hippuric acid. As we have seen that in icterus benzoic acid, when swallowed, is not changed into hippuric acid, but re-appears uncombined in the urine; it follows, that most probably in jaundice that no glycocholic acid, but taurocholic acid, or perhaps only cholalic acid, is formed in the liver. Kühne examined the urine of an icteric patient, in the wards of Professor Virchow, for glycin and taurin, but found neither; whereas, if glycocholic acid had continued to be formed in the liver, had been absorbed into the blood and aftewards excreted by the urine, of course glycin ought to have been detected in the latter fluid. It must, however, be remarked that the process employed for the detection of glycin and taurin was not such a good one as to demonstrate with certainty the absence of these substances.

Kühne's next series of experiments proved that the soda salts of glycocholic, cholalic, and choloidic acids, after being injected into the veins, again leave the bodies of the animals unchanged through the kidneys.

It is worthy of remark that the dogs thus operated on very often died suddenly immediately after the injection of the bile-acid salts, without it being ever possible to prove the entrance of air into the veins, at the post-mortem examination of the body made directly after death. This circumstance has been observed by other experimenters. It is possible that the injection of bile-acid salts into the blood may be the cause of great disturbance in the system. In one of the experiments, ten minutes after the injection of 15 cub. centim. of a 6 per cent. solution of glycocholate of soda into the right jugular vein, spasms resembling completely an epileptic fit came on, and lasted half an hour. Kühne has not been able to obtain the same result

again, although he has often tried. But he has observed that in most cases, in a longer or shorter time after the injection, a condition arose characterized in the same way in all the animals by somnolence and diminished appetite. None of these conditions had, however, any influence upon the composition of the urine.

Thus Kühne's results contradict completely those of Frerichs, who asserts that after the injection into the blood of glycocholate of soda, or any other pure bile-acid salt, bile-colouring-matter appears in the urine, while unchanged bile-acids are never to be found.

In most of Kühne's cases experimented on as above described, there was a small quantity of albumen in the urine. In two cases there was hœmaturia. Dusel was the first who observed hœmaturia after the injection of bile-substances into the blood in rabbits. Frerichs observed hœmaturia seventeen times out of twenty-nine injections. Kühne does not know the exact conditions under which hœmaturia supervenes—why it comes on in some cases and not in others.

Frerichs and Staedeler were, as is well known, the first to observe the appearance of bile-colouring-matter in the urine after the injection of colourless bile-substances, a fact which is confirmed by Kühne's experiments, as well for the glycocholate as for the cholalate and choloidate of soda. The quantity of the excreted bile-colouring-matter appears, however, to be subject to considerable fluctuation, and it is this circumstance which has caused Frerichs to assert that the bile-colouring-matter in such experiments may be entirely wanting in the urine. It sometimes, indeed, happened to Kühne that, after the above experiments, the urine had no icteric appearance at all, and by mixing it with nitric acid, showed no characteristic change of colour, but, by a more careful examination, it was possible to demonstrate the presence of bile-colouring-matter by the nitric acid test.

In such cases, the mode of proceeding particularly to be recommended is to pour into a test-tube a layer of nitric acid about one inch high, and then, by means of a pipette, to allow the urine to run down the walls of the glass so slowly and carefully that it can scarcely mix with the acid. Then, if bile-colouring-matter be present at the point of contact of both fluids, the characteristic colours are seen as beautiful rings;—in this way this test obtains such an extraordinary degree of exactitude, that one can even detect the bile-colouring-matter in bile so much diluted with water, that the fluid in a layer 4 cub. centim. thick appears only slightly coloured. Of course,

the nitric acid ought to contain only very little nitrous acid, as an excess of the last again destroys the colours. Kühne used quite pure, colourless, nitric acid. If one proceed in the above way with *normal* urine, one sees arise between the latter and the acid, for the most part, an intense red, sharply-defined ring, which, however, cannot be mistaken for the proper bile-colouring-matter reaction, as the latter is easily distinguished by the supervention of violet and green rings.

How can this invariable appearance of bile-colouring-matter in the urine after the injection of colourless bile-acids into the blood be explained? This question and the hœmaturia coming on in these cases admit of easy solution by the fact discovered by Hühnefeld, Plattner, and Simon, viz., that the bile-acids and their salts have the peculiar property of dissolving the blood-corpuscles. The blood-corpuscles of mammalia and birds are easily dissolved by bile and bile-acids, but those of the frog are not so. On the other hand, the liver cells of mammalia and birds are *not* dissolved by bile and bile-acids, but those of the frog *are*, at least in the spring, viz., in February, March, and April.

Kühne, therefore, attributes the appearance of bile-colouring-matter in the urine after the injection of colourless bile-acids into the blood, to the hematin set free by the solution of a certain number of the blood corpuscles.

Unfortunately, it has not yet been possible to form out of the body, bile-colouring-matter from the colouring-matter of the blood.

What the chemist has not yet succeeded in doing, namely, in separating hematin from bile-colouring-matter, we see easily accomplished in the living animal. If a bile-acid-salt be injected into a vein, soon afterwards free blood-colouring-matter and bile-colouring-matter appear in the blood. In most cases, the greater quantity of the bile-colouring-matter goes over alone into the urine, and only sometimes the blood-colouring-matter follows it. But in the latter case it is easy to recognise each substance by itself, as was seen in those experiments where hæmaturia came on.

Kühne then made some experiments by injecting free hemato-globulin into the veins of dogs. The hemato-globulin used for this purpose was prepared in the following way :—The dog experimented on was bled 24 hours before to 20-50 grammes, according to the weight of his body—the venesection was generally performed in the afternoon; then by the next morning, the coagulum and serum had so far separated from each other, that the former could be taken out, and, by careful washing, could be almost entirely freed from serum. The pure coagulum

containing all the blood-corpuscles was then mixed with 5-6 times its volume of distilled water, and sucked into a syringe with a wide opening, by drawing up the piston, which could be easily done completely after several pulls. Thus, by repeating this, first with the largest and lastly with the finest canula placed on the syringe, it was very easy to break up the cake of 50 grammes of blood, within five minutes, to such an extent, that the fibrine appeared suspended in the fluid only as a fine, flaky cloud. After this latter had, for the most part, sunk to the bottom, the fluid was then carefully poured off and filtered. The filtered fluid contained now scarcely any uninjured blood-corpuscles; so that in this way was obtained a tolerably concentrated solution of hemato-globulin, the preparation of which required so little time, that a venesection and an injection could always be made in the same dog within 24 hours.

If now, Kühne injected into the jugular or crural vein of healthy dogs 15 cub. centim. of such a solution of hemato-globulin, heated previously to 32° C., which could easily be done without the least hurt to the dog, generally on the next morning, a tolerably dark-coloured, alkaline, albuminous urine was passed, which showed a reaction, with nitric acid, resembling that of bile-colouring-matter, but not proving unequivocally the presence of the latter. When the albumen was removed by heat and acetic acid, and the fluid tested for bile-colouring-matter, the result was negative. But it is possible that a small quantity of the bile-colouring-matter may have remained sticking to the albumen when the latter coagulated. Therefore, it is not right to reject altogether the supposition that bile-colouring-matter may arise out of free hemato-globulin contained in the serum under otherwise quite normal conditions. But the following experiments prove that the *presence of bile-acids in the blood* is not without great influence in the formation of bile-colouring-matter out of the hemato-globulin: A dog that had before only been subjected to an injection of hemato-globulin, had now 15 cub. centim. of such a solution, with the addition of only 0·5 cub. centim. of a 4 per cent. solution of glycocholate of soda injected into the left jugular vein. *The urine of the dog next day* contained albumen, and *gave a splendid reaction of bile-colouring-matter with nitric acid.* This experiment was repeated twice with the same result. When the same quantity 0·5 cub. centim. of glycocholate of soda was injected alone into the veins, without the solution of hemato-globulin, the urine of the dog afterwards contained but a trace of bile-colouring-matter. It must be remarked that, as it would not be possible to inject so small a quantity as 0·5 cub.

centim. of glycocholate of soda solution by itself, it was mixed with 15 cub. centim. of defibrinated blood of the same dog, and then injected.

Hence, Kühne concluded that blood-colouring-matter, is converted into bile-colouring-matter, when the former is subjected to the yet unexplained influence of the bile-acids.

There are two things here to be distinguished. 1. That the injection of large quantities of bile-acid-salts into the blood deprives a large number of the blood-corpuscles of their membranes, and hence brings free hemato-globulin into the blood-plasma. 2. Hereupon the injected-material works in an unknown manner upon the blood-colouring-matter set free, without, however, undergoing any change itself, as its passage over into the urine unchanged shows.

Kühne considers that the fact of the solution of the blood-corpuscles in the living body by bile-acid-salts, and the formation of bile-colouring-matter out of blood-colouring-matter, gives support to the theory that a not inconsiderable amount of blood-corpuscles is destroyed in the liver, and that the colouring-matter found in the bile represents the changed product of the hematin which had been contained in this portion of the blood-corpuscles dissolved. And, with this idea, it is interesting that further experiments of Kühne's have proved that there is no difference in the solubility of the corpuscles of the blood in any of the veins or arteries of the body.

Kühne then subjected to analysis the *healthy* fœces and urine of dogs, before proceeding to the chemistry of the liver-secretion in icterus artificially produced. He found that cholalic acid, choloidic acid, and dyslysin existed *normally* in the dog's fœces, and in such large quantity that he concludes that almost none of the bile-acids are re-absorbed from the intestine, but that they pass off, for the most part, in the excrements. This idea is strengthened by the fact shown above, that bile-acids pass unchanged from the blood into the urine; and, that, therefore, there would be no reason why *healthy* urine should not contain bile-acids, if the latter were absorbed normally into the blood; but, as we have seen, *healthy* urine contains no bile-acids. Bidder and Schmidt were the first who asserted that the constituents of the bile were, in a great measure, re-absorbed from the intestine, because they found that the sulphur-smell of the fœces did not represent, by any means, that of the bile secreted in a corresponding time. But it by no means follows that bile-acids are re-absorbed from the intestine, because the sulphur belongs alone to the taurin; and it is quite possible that the glycocholic and tauro-

cholic acids, after their undoubted division, only give up the glycin and taurin as easily soluble bodies to the general circulation. It is difficult also to conceive how such a slightly soluble salt as the cholalate of soda can be absorbed, more especially as the presence of choloidic acid and dyslysin in the fœces shows that the bile-acids must have remained a long time in the intestine.

As regards the *normal urine* of dogs, Kühne never detected, even in 5 litres of the same, bile-acids, by means of Hoppe's method. Neither could, in the same quantity of urine, traces of benzoic acid be found according to Liebig's or Lehmann's method.

Kühne found that in animals with biliary fistula, where there was some obstruction to the excretion of bile by the fistula, bile-colouring-matter may appear in the urine *without* bile-acids.

Kühne tied the ductus communis choledochus of a dog, so as to prevent any excretion of bile, and found that its blood, twenty-four hours after the application of the ligature, already contained bile-acids.

The method employed for detecting bile-acids in the blood was as follows: the whole blood was dried in a water-bath by a gentle-heat, afterwards in an air-pump, then the dried mass was thoroughly pulverised. The latter was now extracted with a great excess of absolute alcohol; the alcohol filtered, evaporated, the residue dissolved in water, and the watery solution, by boiling with a drop of acetic acid, and filtering it from the coagulum which thereby formed, freed completely from every trace of the albuminate of soda. Then it was again evaporated, the residue again dissolved in alcohol, the latter expelled by heat, very little water added and filtered. In the filtered fluid which, therefore could contain neither fats nor albuminates, sugar and sulphuric acid should produce, when bile-acids were present in the blood, the most beautiful violet colour.

The above dog was operated on on the 26th April, 1858, and the urine soon afterwards became of a deep jaundiced hue; on the 7th May, however, the appearance of this fluid changed in a remarkable way—the quantity of bile-colouring-matter contained in it began visibly to diminish until, at last, the urine assumed quite a pale-yellow appearance. However, there was always a trace of bile-colouring-matter to be detected by nitric acid, and the quantity of bile-acids continued almost the same throughout. When the quantity of bile-colouring-matter in the urine was reduced to a minimum, Kühne injected 15 cub. centim. of a solution of hemato-globulin prepared in the way

above described, into the right jugular vein. The result was the appearance of a *considerable amount* of *bile-colouring-matter* besides albumen and bile-acids in the urine of next morning.

The day following, however, the amount of bile-colouring-matter in the urine was again very small. Two other injections of hemato-globulin were made with the same result.

It was most remarkable that during the whole time of the ductus communis choledochus being impervious, the dog had not an icteric appearance. The conjunctivæ remained uncoloured as well as the rest of the body, and only the urine showed, by the presence of bile-colouring-matter and bile-acids, the true icteric condition. But here in the urine we saw the bile-colouring-matter at last almost entirely disappear, while the cholalic acid was always in undiminished quantity excreted from the body. Unfortunately, the ductus communis choledochus became again pervious, as was evidenced by the sudden excretion of strongly-coloured fœces, and the contemporaneous disappearance of the bile-acids from the urine. This happened on the 18th May, twenty-two days after the operation.

Kühne repeated the above experiment on another dog with exactly the same results. This second dog died eight days after the operation.

In icteric urine the small quantity of hippuric acid contained in *normal* urine, is absent. This circumstance is interesting as showing that the origin of hippuric acid, which is independent of the introduction of the benzoyle-compounds into the blood, appears to be in the liver.

Kühne thinks it advisable, in the examination of icteric urine, that attention should be chiefly directed to the detection of *cholalic acid*, when bile-acids in general are sought for. The shortest method of detecting cholalic acid in the urine is the following:—

Evaporate the urine as far as possible; if the residue re-act neutral or alkaline, acidulate it slightly with hydrochloric acid, and then triturate with pure quartz-sand. Shake up the solid residue sticking to the sand-grains in a closed bottle, moisten with very little alcohol, and then extract completely with ether. After twenty-four hours, pour off the ether, evaporate the latter, treat the remaining brown resinous mass which, besides some urea, contains the cholalic acid, with boiling water, and then filter boiling hot. The filtered fluid precipitates, after some minutes, resinous flakes on the walls of the glass, from which the fluid can be easily poured off. If the flakes be now poured over with some sugar-water, and sulphuric acid be added

carefully, very soon the characteristic violet colour can be observed.

The result of Dr. Kühne's observations may be briefly summed-up under the following heads:—

1. In icterus caused by closure of the ductus communis choledochus, the urine contains *always* bile-acids and bile-colouring-matter.

2. The presence of bile-acids in the urine is a peculiarity of icteric urine only.

3. In jaundice, when benzoic acid or its alkaline salts are taken into the stomach, they re-appear unchanged in the urine.

4. It, therefore, follows that no glycocholic acid is formed in the liver during jaundice, but taurocholic acid or perhaps only cholalic acid.

5. Bile-acids are not decomposed in the blood. In whatever manner they find their way into that fluid, they are afterwards excreted by the kidneys. Glycocholate of soda passes out from the blood unchanged into the urine. When the cholalate and the choloidate of soda arrive in the blood, there are found in the urine soon afterwards substances which give the Pettenkoffer reaction.

6. After the injection into the veins of colourless solutions of bile-acids or their salts, bile-colouring-matter appears in the urine.

7. The appearance of bile-colouring-matter in the urine after the injection into the veins of colourless bile-acids or their salts, is explained by the fact of the latter having the property of dissolving the blood-corpuscles, and thus setting free a quantity of hematin, which being acted on, in some yet unexplained way, by the bile-acids or their salts, is converted into bile-colouring-matter.

8. It is probable that a considerable number of blood-corpuscles is destroyed in the liver, and that the bile-colouring-matter is derived from the hematin set free by the solution of these corpuscles.

9. The bile-acids, for the most part, pass off by the fœces, and are *not* re-absorbed from the intestine.

ON THE PATHOLOGICAL PRODUCTS IN THE LIVER AND KIDNEYS IN LEUKÆMIA.

By Arthur Boettcher.

From "Virchow's Archiv.," 5th and 6th Part of 14th Vol., Nov. 1858.

(Abstract by George Scott, M.D.)

AFTER Virchow had thoroughly established, that the origin of leukæmia could always be referred to an affection of the spleen, or of the lymphatic glands, accompanied often by disease of the liver, he called attention to the supervention in this malady, of pathological formations in the liver and kidneys, resembling lymphatic elements. This induced him to admit, along with the lymphatic dyscrasia, a kind of lymphatic diathesis, a progressive disposition on the part of the organs to produce lymphatic elements, an observation of great interest in connexion with the history of the scrofulous and tubercular processes.

Since then Friedreich has related a very interesting case, in which leukæmic tumours were found in the pleura and in the intestinal canal, the origin of which he could refer to the corpuscles of the connective tissue.

Of a similar kind is the case related below, where besides new products in the small intestine, similar ones were found in the liver and kidneys, the origin and relation to the original tissue of which could be accurately observed.

The patient was a man aged 40, who died in the Dorpat Hospital in May, 1858, at the post-mortem examination, the leukæmic nature of the process was sufficiently established, by microscopical examination of the blood.

The mesenteric glands were greatly enlarged, some being of the size of a hen's egg, the axillary and inguinal glands, and those of the neck were also much hypertrophied. The *liver* was large, weighing 7 lbs., and reaching pretty far towards the left side. It was granular on the surface, *i. e.*, small, protruding, greyish-white masses, of the size of a small seed, semeed to be imbedded in the brown-red parenchyma of the organ. These granular masses formed thus numerous, small, whitish-coloured islands between the dark lines of the hepatic tissue surrounding them. On section, the liver was anæmic, bright coloured, very firm and resistent, the cut surface shining like wax. It was everywhere interspersed with little greyish-white masses, which had not only the round form, as on the surface, but also that of longer and shorter striped figures.

These round granular masses were continued into those of a linear shape, so that the connexion between these two kinds of bodies was not to be mistaken. The *spleen* was greatly enlarged, weighing 1½ lbs., irregularly notched at the edge; the surface of the same smooth, tight, resistent; parenchyma anæmic, of a bright-red colour, homogeneous, resembling wax; follicles not visible; trabeculæ indistinct.

The left *kidney* of usual size; on its otherwise smooth surface was seen a cyst of the size of a pea. Capsule of the kidney easily separated. Cortical as well as medullary substance remarkably pale, very firm, homogeneous, and shining. Malpighian corpuscles distinct. The *right* kidney showed, as regards consistence, colour, and texture, the same condition as the left, but it was somewhat increased in breadth. In the lower part of the *small intestine* not only closely aggregated solitary glands, but, besides these, numerous small punctated swellings of the mucous membrane were seen.

The interest of the above case is concentrated chiefly on the pathological products found in the liver and kidneys.

In the liver the microscope shewed that the above-mentioned greyish-white islands, were composed, for the most part, of closely aggregated nuclei, in some of which a nucleolus was distinctly seen, but the greater number had no nucleolus, and presented a more homogeneous, shining, rigid appearance. The nuclei did not appear completely spherical, but had lateral surfaces as if they had been flattened against each other by pressure. Besides the nuclei there were seen here and there larger structures, viz., small, slightly granulated cells, in which the nucleus appeared after the addition of acetic acid, but always closely surrounded by the cell-wall. Divisions of the nucleus were never observed; there was never more than one present which almost completely filled the whole cell. The above nuclear structures were seen to be embedded in a finely fibrous mass, in some places more abundant than in others, so that sometimes the latter, sometimes the nuclei, were the most prominent objects. The nuclei were especially numerous in the centre of the granular masses. When one of these grains was isolated, brought under the microscope, and slightly pressed, there came out of the centre a mass, consisting almost entirely of nuclei, while the sides of the granular body possessed a membranous consistence, but were everywhere interspersed with these nuclear products. The above-mentioned granular bodies seen on the surface of the organ, were not isolated grains imbedded in the liver substance, but, on section of the latter, they were seen to be continued as stripes or prolongations,

dipping for some distance into the liver-parenchyma. If one of these were isolated as much as possible, the granular body could be seen attached to the end of the prolongation, as it were on a stalk or style; and sometimes two granular bodies could be isolated, and seem to be on one common style. The deep end of the style had a fringed appearance, and looked as if it had been torn. When carefully examined, these prolongations or styles were seen to be vessels, in the walls of which numbers of these nuclear products lay. Sometimes the calibre of the vessel was thereby only narrowed, sometimes however it was entirely closed. It was possible, with some trouble, to trace from a large vascular trunk to a minute branch, having one of these granular bodies attached to its end.

On examining sections of the liver, hardened by chromic acid, by a low power of the microscope, these granular bodies, composed of a thickly aggregated mass of new products, seemed as if separated by a sharp boundary line from the proper hepatic substance, and as if they had pushed aside the liver-cells to make room for themselves, but when more highly magnified, at the apparent line of separation between them and the hepatic substance, nuclei were seen to be continued from the former, between the individual liver cells. The latter were wider apart than natural, and sometimes considerable numbers of nuclei were seen in the intercellular spaces. When the nuclei were less numerous, the intercellular substance could be seen to possess a distinctly fibrous structure. Nowhere could the nuclei be surrounded by cell-wall so as to indicate their origin from the corpuscles of the connective tissue.

It was very much easier in the kidneys to demonstrate the mode of origin of these new products. On placing sections of the cortical substance under the microscope, masses of these nuclei were seen imbedded in the connective tissue, occupying the spaces between the tubuli uriniferi, and between the latter and the Malpighian corpuscles. In these situations the nuclear bodies were in groups of 3, 4, and 5, or more, until they were so numerous that they could no longer be counted, and in many places were in a distinctly circumscribed space; sometimes indeed they could be distinctly seen occupying the interior of long-shaped bodies, the corpuscles of the connective tissue, thus showing the origin and development from the latter. That this circumstance was only seldom seen distinctly is not to be wondered at, when we consider how difficult it is to trace the development, *e. g.* of tubercle in the tissues.

In many places in the kidneys, the tunica propria, was seen to be thickened by the deposition of these nuclei, and the calibre of the tubes consequently diminished. In the course of the

vessels the development of the new products had attained such an extent, that they formed broad bands of closely aggregated nuclei, resembling strongly those in the liver. Under these circumstances only remnants of the tubuli uriniferi in the neighbourhood were to be seen; sometimes even they were entirely destroyed; the latter, however, was rarely the case. These nuclei in the kidneys were all of much the same size; they were slightly granulated, and were provided with one or two distinctly visible nucleoli.

Between the straight tubes, at the bases of the pyramids, were sometimes seen single, sometimes double and triple rows of these nuclei.

Boettcher thinks it extremely probable that the vessels connected with the granular bodies in the liver were lymphatics, but he cannot say this with certainty. If this conjecture be correct, more strength is given to the supposition of a relation between the corpuscles of the connective tissue and the lymphatic vessels. For, in the case before us, we have Leukæmia, a hypertrophy of the lymphatic glands, and, at the same time, new products in the liver and kidneys, resembling the lymphatic elements, those in the former organ connected, in all probability, with the lymphatic vessels, and those in the latter, distinctly seen to be developed from the corpuscles of the connective tissue.

The pathological products above described were found only in the cortical substance of the kidney, and in the bases of the pyramids. The tubular epithelium of the middle and of the apices of the medullary portions was destroyed, while that of the bases of the pyramids and of the cortical substance was well preserved.

There was an interesting pathological change in the vessels of the pyramids, and, in a slight degree, of those of the cortical substance also. The arteriolæ rectæ were in many places rigid, very brittle, and of a homogeneous shining appearance. On section, the walls were seen to be variously thickened, whereby the calibre of the vessel was diminished, and sometimes to such an extent that the cavity appeared only as an oval or star-shaped slit. Sometimes the above-described pathological change affected the whole length of the arteriole, sometimes only a part of it. Tr. iodinei and sulphuric acid caused the diseased portions of the vessels to become of a violet colour. In the cortical substance, only the larger trunks of the vessels were slightly diseased, while the glomeruli and the afferent and efferent vessels of the same were not at all affected.

As regards the *spleen*, both in fresh preparations and in those hardened by chromic acid, besides the well-known

spindle-shaped bodies, only a thickly aggregated mass of young cells and nuclei were to be seen, which sometimes lay quite free, sometimes were imbedded in a fibrous tissue and possessed a homogeneous, rigid appearance. Neither the trabeculæ nor the follicles were distinctly seen.

In the mucous membrane of the *intestine* there were observed, besides the normal solitary glands, numerous granular masses, varying from the size of minute points to that of the solitary glands. The smallest were seen only on holding the intestine up to the light, when they were perceived as numerous very minute points imbedded in the structure of the intestine. These granular bodies, both larger and smaller, were seen, under the microscope, to be composed of elements resembling the lymphatic corpuscles, quite similar to the pathological products in the liver and kidneys. The connexion of these granular bodies with the intestinal structure was not made out.

In Leukæmia the spleen is always enlarged, but it may present after death two distinctly different appearances :—

1. Although the organ may be greatly hypertrophied, its substance may present a perfectly normal appearance.

2. Along with the enlargement, the parenchyma may be firm, very resistant, of a bright red, greyish, or brownish colour, and of a homogeneous, dry, dull, shining appearance. This resembles very closely what has been described as the waxy spleen. In the majority of cases of Leukæmia we have the latter condition—hypertrophy of the spleen along with induration of its structure : the latter is by no means characteristic of the disease; on the contrary, the same kind of induration may occur in other affections. Of course, when we have both hypertrophy and induration of the organ, the former state has preceded the latter ; therefore these conditions afford some good information regarding the duration of the disease of the spleen.

In Boettcher's case, the spleen gave the usual violet colour reaction with the tincture of iodine and sulphuric acid, as in the waxy spleen.

In the liver, also, a series of similar changes, as in the spleen, is sometimes observed. Often, indeed, in Leukæmia this organ is not at all changed · when it is so, it is always enlarged, and sometimes merely simply hypertrophied, sometimes also indurated, and showing the appearance and reaction of the waxy degeneration. In Boettcher's case, the liver was indurated as well as enlarged, and gave the violet colour with tincture of iodine and sulphuric acid, but only on those parts where the pathological products were present. The liver-cells were not affected by the reagents. The induration, therefore, seemed thus only to have affected the *new* formations in the liver.

Thus was demonstrated, chemically, an identity between the pathological change in the liver and spleen in the case before us and that supervening in other diseases. It is extremely probable that, in the later period of the malady, the morbid conditions of the liver and spleen had little effect upon the development of the Leukæmia, as although these organs must have become enlarged, they must have afterwards undergone the waxy degeneration. It is more likely that the hypertrophy of the lymphatic glands was the most essential thing in the development of such large quantities of colourless blood corpuscles.

In the cases of Leukæmia related in medical literature, it has been observed that when the liver and spleen were found, after death, merely simply hypertrophied, this disease had run a rapid course, but that, when these organs were indurated as well as enlarged, the malady had progressed more slowly.

It was not an unimportant circumstance that, in the case before us, there was amyloid degeneration of the vessels of the pyramids of the kidneys, and no such degeneration of the new products in the cortical substance of the latter organs This showed that the production of the lymphatic elements in the kidneys was of a later date than that of the same in the liver and spleen, and the renal vascular affection. The comparatively recent origin of the pathological formations in the cortical substance of the kidneys was also indicated by the small number of the nuclear masses, and by some of them distinctly occupying the interior of corpuscles of the connective tissue. Boettcher thinks it probable that this older disease of the vessels of the pyramids, by inducing congestion of the cortical substance, may have predisposed to the pathological change in the latter.

The interesting points in the above case are:—

1. The production, in a well-marked case of Leukæmia, of numerous nuclear structures resembling the lymphatic elements in the liver, kidneys, and intestine, thus shewing what Virchow has called the lymphatic diathesis.

2. The close connexion of these nuclear structures in the liver with, in all likelihood, lymphatic vessels.—This, taken along with the probable development of all these nuclear products from the corpuscles of the connective tissue, strengthens the supposition of the close relation of the lymphatic vessels with these corpuscles.

3. The long duration of the disease, and the waxy indurated appearance of the liver, spleen, and kidneys, seen after death.

4. The affection of the cortical substance of the kidneys, certainly of a more recent date than that of the vessels of the pyramids, thus showing a mechanical cause as predisposing to the development of disease in an organ.

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Glasgow Medical Journal.

Journal de la Physiologie de l'Homme et des Animaux, publié sous la direction du Docteur E. Brown-Sèquard.

American Medical Monthly.

New York Journal of Medicine.

Journal of Practical Medicine and Surgery. English Edition.

Quarterly Journal of Dental Science.

Ophthalmic Hospital Reports and Journal of the Royal London Ophthalmic Hospital.

Archiv für Pathologische Anatomie und Physiologie, und für Klinische Medecin. R. Virchow.

North American Medico-Chirurgical Review.

Archiv für die Holländischen Beiträge zur Natur und Heilkunde.

Guy's Hospital Reports.

*** The Editor will be happy to exchange with other Journals.

BOOKS RECEIVED.

Joseph Lister, F.R.C.S., Preliminary Account into the Functions of the Visceral Nerves, with special reference to the so-called Inhibitory System. A Letter to Dr. Sparpey. Proceedings R.S.

J. Hughes Bennett, M.D., Outlines of Physiology.

A. M. Edwards, F.R.C.S., Introductory Address to his Lectures on Surgery.

Conway Evans, M.D., Reports relating to the Sanitary Condition of the Strand District, London.

John Syer Bristowe, M.D., An Introductory Address delivered at St. Thomas's Hospital.

T. W. Nunn. F.R.C.S., Observations and Notes on the Arteries of the Limbs.

J. Toynbee, F.R.S., A Case of Deaf Dumbness, from the Proceedings of the Med.-Chir. Soc.

Ch. Robin, M.D., Prof. Agrégé, &c., Sur quelques points de l'Anatomie, et de la Physiologie de la Muqueuse et de l'Epithélium Utérin pendant la Grossesse.

Ch. Robin, M.D., Prof. Agrégé, &c., Mémoire sur l'Epithélioma du Rein, et sur les Minces Filaments Granuleux des Tubes Urinipares expulsées aves les Urines.

Ch. Robin, M.D., Prof. Agrégé, Notice sur les Travaux d'Anatomie Pathologique de M. Ch. Robin.

Ch. Robin, M.D., Prof. Agrégé, &c., et M. Mercier, Mémoire sur l'Hématoidine.

Ch. Robin, M.D., Prof. Agrégré, &c., et Ambroise Tardieu, Mémoire sur l'Examen Microscopique des Taches formées par le Méconium et l'Enduit Fœtal.

Ch. Robin, M.D., Prof. Agrégé, &c., et A. Salmon. Mémoire concernant l'Examen à l'Aide du Microscope de Taches de Sang sur une Blouse de Coton Bleu dans un cas d'Assassinat.

Guy's Hospital Reports. Edited by S. Wilks, M.D., and Alfred Poland.

Hardwich, F., Photographic Chemistry. 5th edition.

A. Harvey, M.D., On the Fœtus in Utero as inoculating the Maternal with the peculiarities of the Paternal Organism.

A Harvey, M.D., On the Relation of Psychology to Physiology, a Review reprinted from the Glasgow Medical Journal.

A. E. Sansom, The Mortality after Operations of Amputation of the Extremities.

B. Wills Richardson, F.R.C.S., On Stayphyloma of the Cornea.

J. Hughes Bennett, M.D., Clinical Lectures on the Principles and Practice of Medicine. 3rd. edition.

Thomas Prichard, M.D., Statistical Report of Cases of Insanity.

Edward Smith, M.D., LL.B., B.A., Lond., Researches into the Phenomena of Respiration. Abstract of Papers.

J. M. O'Ferrall, Esq., M.R.I.A., On Hospital Instruction.—An Introductory Address.

Arnold Beer, Die Bindesubstanz der menschlichen Niere im Gesunden und Krankhaften Zustande.

F. D. Schmidt, M.D., Philadelphia, On the Minute Structure of the Hepatic Lobules, particularly with reference to the relationship between the Capillary Blood-vessels, the Hepatic Cells, and the Canals which carry off the Secretion of the latter.

Plate XXVI.

To Illustrate Messrs. Taylor and Hulme's Cases Illustrating the Use of the Ophthalmoscope. Page 284.

Fig. 1. Appearance of left eye of Wm. Mackay (Case 1, p. 285) upon examination with the ophthalmoscope. The cornea, lens, and its capsule, and the vitreous are clear. The optic disc appears strongly shaded, especially towards the temporal side. General hyperemia of the optic disc which is greater near the nasal side, where the disc is marked with very fine bluish striæ. Retinal vessels rather more branched than usual; otherwise normal. The retina preserves its transparency. The choroid is also normal.

Fig. 2. Ophthalmoscopic characters of the left eye of Wm. Brown, aged 36 (Case 2, page 285). Optic disc of a dull grayish pink colour, with faint striæ of a more decided pink. The outer part of the disc is surrounded for about two-thirds of its circumference with a line of black pigment, while the remainder towards the outer side appears shaded as if the disc were slightly elevated above surrounding parts. The vessels of the art. cent. retinæ are much enlarged and their contents have not the bright tint of arterial blood. Several of the vessels are bordered on each side by a fine white line, probably caused by the effusion of plastic exudation. The entire retinal surface is of a much brighter red than in the healthy eye, and presents a velvety appearance which completely conceals all trace of the choroidal vessels, as well as of the macula lutea.

Figs. 3 and 4. Right eye of John Devine, aged 39 (Case 3, page 286), which was damaged 22 years ago by a blow. Capsule of lens suspended in its ordinary position. The nucleus of the lens remains unabsorbed at the bottom of the capsule. The two fine lines shown in fig. 4 are the remains of the suspensory ligament as seen when the patient is made to look upwards to the ceiling. Two small patches of uvea are seen on the inner side of the capsule.

Fig. 6. Right eye of Mary Smith (Case 4, page 286), showing appearance of the optic disc when the eye is everted. The edge is not circular and clearly defined as it should be, and the surface of the disc is highly injected with numerous fine vessels, to such an extent on the outer side that the continuity of its

circumference is quite lost. Numerous small vessels are seen directed towards the macula lutea, and large tortuous branching vessels perforate the centre of the disc. Black pigment is seen deposited on the surface of the disc, as well as around its edge. The white, roundish, clear-cut spots are due to the bright sclerotic shining through the choroid which is atrophied and deficient in its pigment in those parts.

Fig. 5. Parts over the macula lutea of the same eye, when the patient is made to look directly forwards, showing extensive choroidal deficiency and irregular deposition of pigment.

Plate XXVII.

Illustrating Dr. Arthur Farre's Paper on the Structure of Diplosoma crenata, an Entozoon inhabiting the Human Urinary Bladder. *Page* 290.

Fig. 1. One of the largest and most perfect specimens of the entozoon, of the natural size. In the centre, at the upper part of the figure is the sharp twist or kink, where the body is most contracted. From this point each half gradually enlarges to a certain distance, but tapers again towards either extremity; the right half terminating, in this specimen, in a point, the left furnished with a lateral membranous flap. This half of the body shows the abdominal groove, and double crenate border. The right half, being spirally twisted, exhibits successive portions of the dorsal, lateral, and abdominal surfaces. This twisting is observable in many specimens. Towards the extremity of this half numerous fibrous cross-bands are shown.

Fig. 2. A smaller but very perfect specimen, representing the more ordinary size of the worm. In the right half the dorsal, and in the left half the ventral aspect, with the abdominal groove and crenate border, is shewn.

Fig. 3. A less perfectly developed specimen, in which the body is nearly smooth, exhibiting no trace of the ventral groove or the crenate border.

These three figures suffice to illustrate the principal varieties in form of this entozoon; but the intermediate gradations are so numerous, that, in many hundred worms passed by this

individual, scarcely two were found alike in every particular. Most of the specimens of the size of, or larger than fig. 2, exhibit, more or less perfectly, the crenate border and central abdominal groove with the corneous band. But these parts are generally absent in the thinner and smoother specimens represented by fig. 3, which are probably the younger or undeveloped worms. However variable the form of the specimen, the component tissues are alike in all.

Fig. 4. Magnified view of the central contracted portion of the worm, exhibiting the rough or broken surface often observed at this part. Leading up to this point are the terminations of the abdominal groove of either half. The inner angle formed opposite to this point cannot be obliterated by stretching, showing that the bending here, which is uniformly midway between the extreme points, is not accidental.

Fig. 5. Lateral view of a portion of the worm, showing the crenate border unusually distinct and perfect. × 8.

Fig. 6. Abdominal view of another portion, showing the ventral groove in which the corneous band is contained. The crenations are much more distinct in one lateral border than in the other, as is usually the case. × 3.

Fig. 7. *a*.—Portion of another worm. The ventral groove and double crenate border very distinct. *b*.—The crenate border alone, from another specimen. *c*.—Single crenature. *d*.—Portion of the opposite or plainer border. × 2.

Fig. 8. Dorsal aspect of a portion of a worm.

Fig. 9. The white ramified cord, seen only on one occasion.

Fig. 10. Portion of the subventral corneous band, showing the arrangement of the cells. At the lower left hand corner are seen several of the peculiar zig-zag muscular fibres, which remained attached to the fragment after it had been pulled out of the groove. × 200.

Fig. 11. Portions of the same specimen more highly magnified. Many of the cells exhibit the central pore or nucleus. Others are represented in different stages of fission. Where the cells lie closest several show a dentate margin.

Plate XXVIII.

Illustrating Dr. Arthur Farre's Paper on the Structure of Diplosoma crenata, an Entozoon inhabiting the Human Urinary Bladder.

Fig. 12. Portion of one of the crenatures from the lateral border. It is composed of parallel-lying fibres, terminating in still finer filaments, that ultimately form a net-work, contained between the layers of a structureless diaphanous membrane. × 200.

Fig. 13. Bundles of similar fibres, forming a brush-like margin, observed in many specimens on the opposite side to the crenate border, and elsewhere. *a*.—More dense bundle. *b*.—Separate fibres. *c*.—One of these more highly magnified, showing the transverse lines occasioned by close zig-zag foldings of the component fibres. × 100 and 420.

Fig. 14. Portion of the peculiar zig-zag muscular fibre, most distinctly seen in the transverse tegumental bundles fig. 18, and attached to the corneous band. Fig. 10.

Fig. 15. Nucleated and granular cells and fibres, composing the tegumental surface of the worm. × 420.

Fig. 16. Terminal portions of three zig-zag muscular fibres, as shown in fig. 14. In two of these the broken ends exhibit the component sarcous fibrils. × 670.

Fig. 17. Portion of parenchyma from the centre of the body. It consists of white filaments and granular cells. The filaments run chiefly in the longitudinal direction. The entire parenchyma of the worm is made up of this structure, with occasional zig-zag fibres in certain positions.

Fig. 18. Portion of the tegumental or outer layer of the worm, consisting of groups of nucleated cells arranged upon a diaphanous basement membrane. The latter is thrown into numerous ridges and furrows, occasioned by sub-lying longitudinal bundles of fibres, which are bound together by transverse cords composed of the fibres represented in fig. 14.

Plate XXIX.

To Illustrate Dr. Lionel Beale's Paper on the Straight Vessels (Vasa Recta) of the Pyramids of the Kidney. Page 300.

All the figures ×15.

Fig. 1. Section through the base of a pyramid of the human kidney which had been injected from the artery. *a.* and *b.* are branches of the artery, lying in the interval between the cortical and medullary portions of the kidney, and passing outwards towards the cortex. Some of the small branches coming off from these trunks are seen to terminate in the usual manner, by giving off small arteries to Malpighian bodies. Others pursue a more or less horizontal course, and anastomose very freely, so that if one or other of the trunks were obstructed at a point anterior to its division, the blood would be carried by these anastomosing branches into the trunk beyond the obstruction. Many anastomoses also occur between vessels coming off from the same trunk. Now, it will be observed at several points, that branches coming off from these horizontal vessels pass downwards into the pyramids (above and below *b.*), and divide into numerous straight vessels (*vasa recta*). This point is seen very clearly. In this preparation several of the bundles of straight vessels are seen to have their origin *direct* from an artery, but the *majority* are doubtless connected with the efferent vessel of a Malpighian body.

Fig. 2. Manner in which the efferent vessel from a Malpighian body (human) divides into a number of straight vessels.

Fig. 3. Different manner of branching of an efferent vessel (human).

Fig. 4. *a.*—Straight vessels from a Malpighian body. *b.*—A branch direct from the small Malpighian artery just before it becomes connected with the Malpighian body. *c.*—An efferent vessel probably from a Malpighian body, divided.

Fig. 5. Human Malpighian bodies with afferent and efferent vessels.

Fig. 6. Another showing a different manner of branching (human).

Fig. 7. Another (human).

Fig. 8. From the kidney of the mouse.

Fig. 9. From the hare.

Fig. 10. From the horse, showing some vessels coming off directly from the trunk of the artery (above *b.*). Others derived from the efferent vessel of the Malpighian body, *a.*

Fig. 11. Also from the horse, showing vessels coming off directly from the trunk of an artery.

Fig. 12. From the sheep.

Plate XXX.

To Illustrate Dr. Scott Alison's Paper on Blood Calculi (page 246), *and Mr. Michael's Case of Hydatids near the Placenta. Page* 320.

Fig. 1. Left kidney, weighing only 1½ oz.. The infundibula and pelvis are much dilated, and faint traces of the proper structure remain here and there. At the lower part of the drawing a portion of the cortical and medullary structure are represented.

Fig. 2. One of the large and two small black calculi which were found in the pelvis of the kidney.

Fig. 3. Calculus from one of the infundibula as large as a horse-bean (see page 246).

Fig. 4. Membrane with placenta. *a.*—Position in which the mass of the so-called hydatids was found.

Plate XXXI.

To Illustrate Dr. John W. Ogle's Case of the Formation of Vessels in the "False Membrane," found in the Arachnöid Cavity. *Page* 281.

Fig. 1 represents the microscopic structure (by a comparatively low power) of the young blood-vessels with the nuclei in their walls, situated in the substance of the membrane. Here and there fatty and calcareous matters (just over *a*) are seen in connection with the vascular walls.

Fig. 2 represents the same as the above as seen by a higher power. Masses of calcareous and fatty substance (above *a*) are also seen in the substance of the false membrane itself, as well as in connection with the vessels.

Plate XXXII.

To Illustrate the Anatomy of a Tumour under the Tongue. *Page* 318. *Softened Tissue of Optic Thalamus.* *Page* 288. *Blue Deposit in the Urine.* *Page* 311.

Fig. 1. Section of tumour situated under the tongue of a girl, aged 25. The dark shaded portions consist of fatty matter. *a*.—Separate cell membrane. *b*.—Ditto resembling cells of epithelium. The structure of this tumour is closely allied to that of a cholesteatomatous tumour.

Fig. 2. Softened cerebral tissue surrounding a clot in the optic thalamus and corpus striatum, showing broken nerve tubes and collections of minute oil-globules (compound granular corpuscles or exudation globules).

Fig. 3. Indigo. *a*.—Small crystals obtained by sublimation. *b*.—Larger crystals obtained in the same manner. *c*.—Small crystals of indigo in fluid.

Fig. 4. Uroglaucine or indigo-blue, from the urine of Dr. Eade's case, reported in page 311. *a*.—Small collections of a pale blue colour, like Prussian blue. *b*.—A darker mass formed apparently of a number of small spherical masses. *c*.—The crystals of uroglaucine of a deep purple or violet colour.

ERRATA IN "EXPLANATION OF PLATES."

PLATE XXI., page ix., 3rd line from bottom,

For "Part" read "pair."

PLATE XXIII., page xi.,

For "Fig. 1" read "Fig. 4."
For "Fig. 4" read "Fig. 1."

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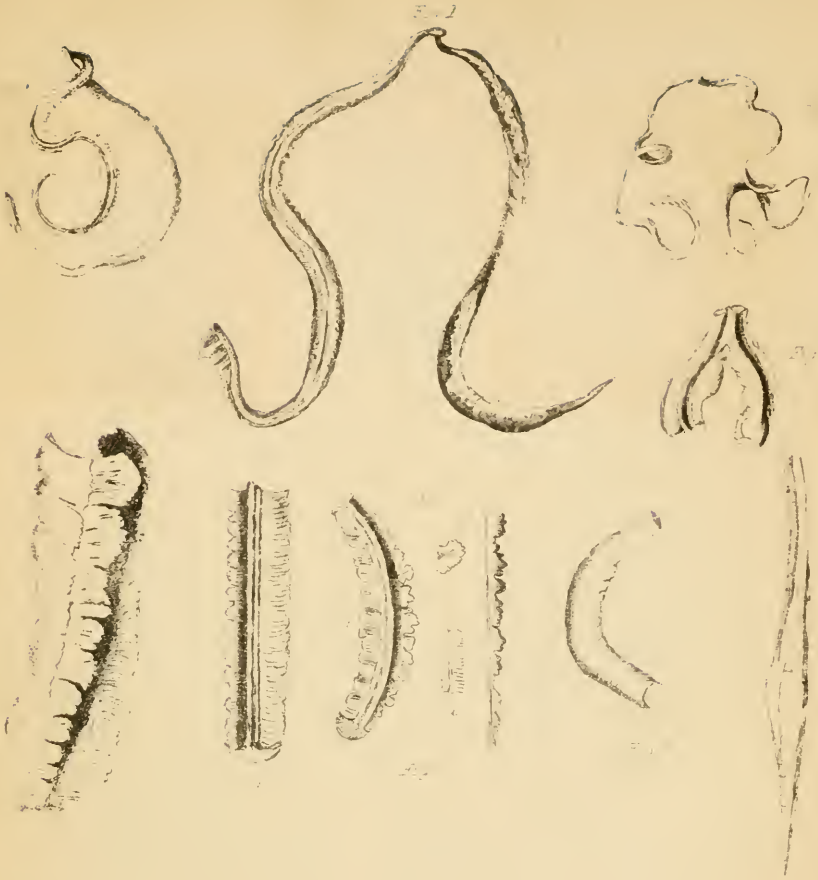

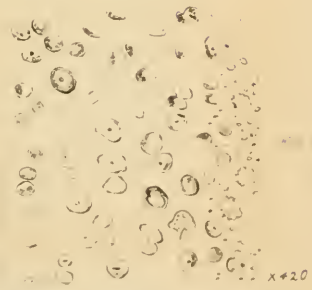

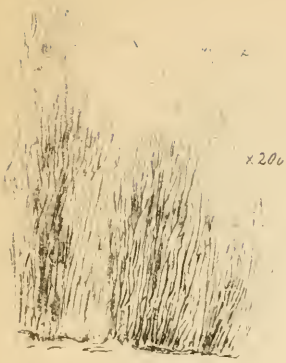

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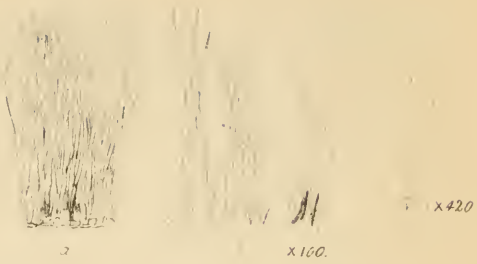

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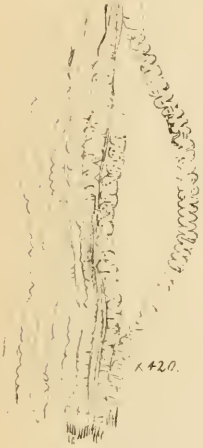

Fig 15

Fig 6

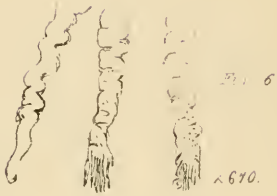

Fig 7.

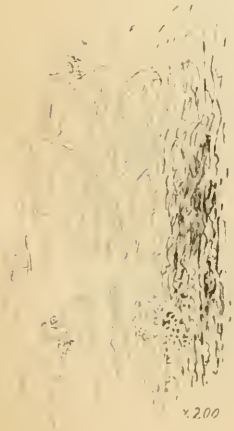

Fig 8.

Fig 1
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Fig 1

Fig 2.

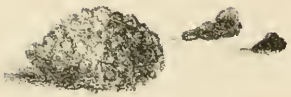

Fig 3

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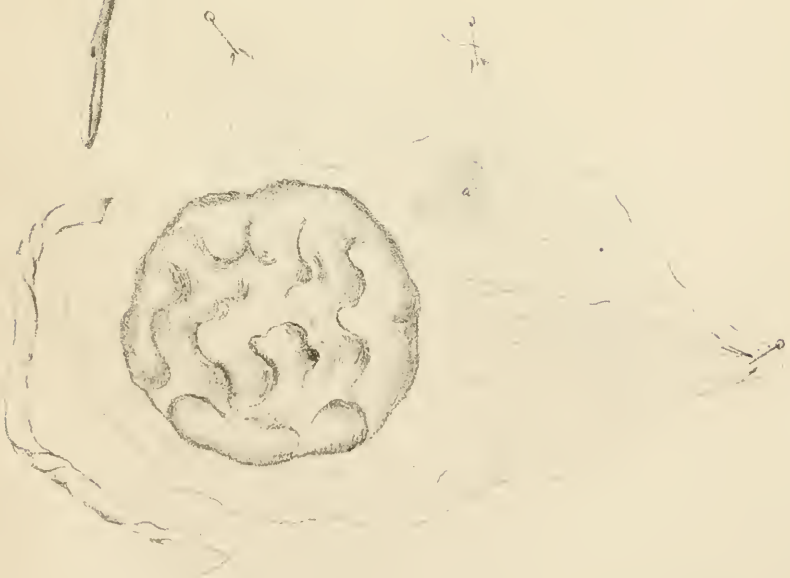

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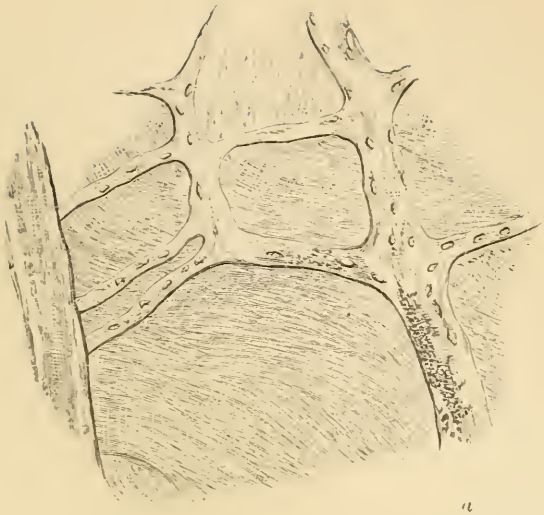

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Fig. 2.

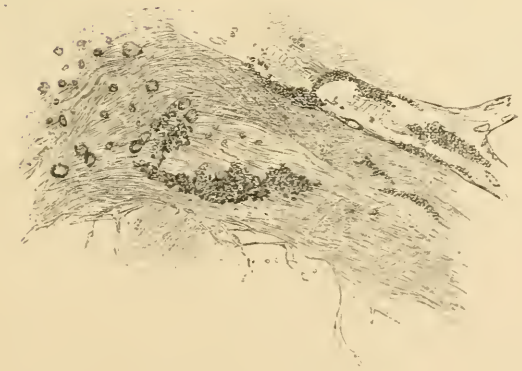

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Fig. 1.

Fig. 2.

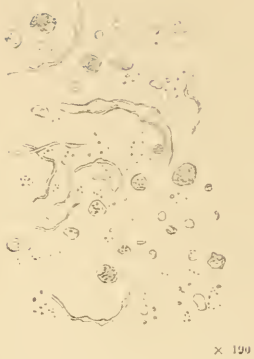
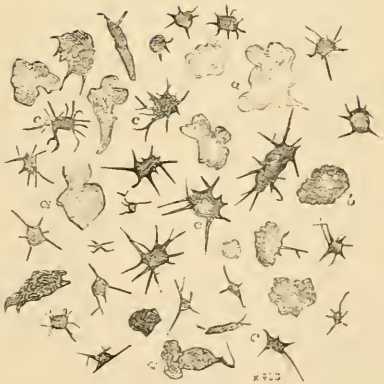


Fig. 3.

Fig. 4.



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THE

ARCHIVES OF MEDICINE.

"Men's qualifications and endowments, though of themselves but slender, and unequal to the work, yet, when properly and regularly used and applied, are capable of bringing such things before the judgment, and into practice, as lie extremely remote from the ordinary sense and action."—Bacon.

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ARCHIVES

OF

MEDICINE:

A RECORD OF PRACTICAL OBSERVATIONS AND ANATOMICAL AND CHEMICAL RESEARCHES CONNECTED WITH THE INVESTIGATION AND TREATMENT OF DISEASE.

EDITED BY

LIONEL S. BEALE, M.B., F.R.S.

VOL. I.

CONTAINING THIRTY-TWO PLATES AND NUMEROUS WOODCUTS.

With Original Papers

BY

Scott Alison, M.D.
Lockhart Clarke, F.R.S.
Arthur Farre, M.D., F.R.S.
W. A. Guy, M.B., Cantab.
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George Scott, M.D.
Robert Taylor, F.R.C.S.
R. B. Todd, M.D., F.R.S.

AND COMMUNICATIONS FROM MANY CONTRIBUTORS.

LONDON:
JOHN CHURCHILL, NEW BURLINGTON STREET.

PREFACE.

This volume of the "Archives of Medicine" owes its existence to the encouragement and valuable assistance which has been given to me, as its editor, by numerous friends. It has long been my desire to see established in England a journal devoted to practical clinical observations and original memoirs upon various subjects bearing more or less upon the investigation and treatment of disease, and containing observations in all branches of minute anatomy and morbid anatomy, researches in animal chemistry, and new experiments carried out with all possible care in every department of physiology and pathology.

The opinion that future advance in the practice of our art mainly depends upon the minute investigation of morbid changes and an accurate knowledge of the processes concerned in the destruction and nutrition of tissues, has been often expressed, though not universally assented to. Many eminent men whose opinions are entitled to, and will certainly receive, great respect, have been led to form a very low estimate of the practical utility afforded by minute investigation to clinical medicine, and have even thought that scientific research would rather impede than assist the proper study of disease. It has been maintained that this minute work, although tending to produce refinement in diagnosis, could exert no beneficial influence upon the treat-

ment of disease. Some have feared that, from men's minds being so much taken up with minute details, they would fail to grasp those great general truths, and would no longer observe with the unaided eye those characteristic symptoms of disease which are at once seized upon by the thoughtful and experienced practitioner, and which have been, and probably will long continue to be, the only sure basis upon which the sound treatment of many cases can be conducted.

On the other hand, the number of those who do not entertain these fears for medicine is rapidly on the increase. They think that, although for a time advance will be almost restricted to diagnosis, yet that, eventually, improvement will be seen in our methods of treatment. They can see no reason why we may not still retain the practical knowledge we possess, and yet learn purely scientific truths, which will by and bye form the foundation for newly-acquired power over disease. Such men will, therefore, look upon this grave question from a different and more hopeful point of view, and it is important that the facts and arguments which have influenced them should be clearly expressed. Being of this number, and at the same time fully sensible of the sound judgment, of the earnestness of purpose and greater experience of many of those who differ from us, I am doubly anxious that the question should be thoroughly investigated in all its bearings. Many of us feel that a minute investigation of the chemical changes going on in the body in health and disease, a painstaking and laborious study of the alterations occurring in tissues and of the conditions which affect these, and such careful inquiries into the structure of morbid growths at different periods of their development as would enable us to write a history of their life would lead to very important practical ends. We hold that when we gain this knowledge we shall be in a better position to treat disease, and we look forward confidently to the time not far distant when the vast labours now being carried on by so many

earnest workers in this department shall add greatly to the results at present obtained, and when we shall possess more influence over the course of morbid processes than we have at present, and thus be instrumental in increasing the average duration of human life.

We hope and believe that from all this minute investigation we shall learn more about the action of the body in health and the nature of morbid changes than we know at present. Those who oppose its being carried out, think that we know as much of these processes already as can be of any practical use in clinical medicine. Its advocates, on the other hand, feel that there yet remains very much to be made out in this department of scientific research, and that the results to be obtained are so important that physicians might advantageously employ part of their time by devoting themselves to some branch of physiological or pathological investigation. It seems hardly possible that those who condemn microscopical and chemical research, and conclude that it can do no real good to medicine, can have considered that all the processes of disease of which as yet we know so little, and that all the incessant changes going on during life, affect particles of matter minute beyond conception. Truly, by employing the highest powers of the microscope at present at our command we are enabled to form only a very rough and imperfect conception of what is actually taking place. Our difficulties are much increased by our not being acquainted with methods of preparing textures for examination, without altering their natural appearances. Still it seems obvious that this rough and imperfect glimpse which we thus gain of the nature of the intricate changes going on in the body, must be better than no such information at all; and besides this, from what has been done already, we are justified in hoping that our means of investigating these wonderful processes will gradually be greatly extended and improved.

Surely, as guardians of the public health and as men whose aim and duty it is to learn how to prolong life, we are bound to investigate, as far as we are able, all the circumstances which in any way affect or modify the due performance of the different functions which constitute health; and as practitioners we certainly ought to make use of every means which science places at our disposal, to combat the deleterious influence of various external agencies, to retard morbid changes which have already commenced, and, when we can do no more, to place a patient, whose organs are impaired by disease, under the most advantageous circumstances for prolonging his life and for ameliorating his suffering.

While, therefore, it has been my endeavour to render the Journal in all respects a journal of *clinical medicine*, I have attempted to do so in the most extended sense in which the term can be used. I hope to receive practical clinical reports and papers on the history, progress, and treatment of disease, and, published in juxtaposition with these, will be the results of inquiries on special points carried out with all patience and care, and with all the delicate contrivances for exactness which modern science has placed at our disposal. With many who entertain similar views I look forward patiently, but with confidence, to the time when a full and sufficient answer will be given to those who now openly or tacitly assail all minute investigations, and, indeed, all earnest research after truths which seem to them to have no practical bearing, with the question of "What is the good of it?"

It is now nearly two years since the first number of the "Archives" was published, and, although the original design is by no means fully carried out in any number which has yet appeared, it is hoped that a sufficient indication of the aim and general object of the work is afforded by the present volume. Every department will be gradually increased, as further assist-

ance, of which I have already received so large a share, is afforded me by friends. Arrangements have been already made for extending the first section of the Journal which is devoted to "Clinical observations."

It has been felt that abstracts of well-marked cases would be of service, and in future a portion of the Journal will be set apart for their publication. From time to time the cases will be arranged in groups, and general conclusions drawn from them.

I am, therefore, desirous of receiving any cases of interest, *surgical* as well as *medical*, and it seems to me desirable to publish not only cases of rare and important affections but well-marked instances of ordinary maladies, such, for example, as uncomplicated pneumonia, erysipelas, rheumatic fever, caries, necrosis, &c. The case should be simply and carefully reported, and the course of treatment briefly but clearly described *in English*. From the report, a short history of the progress of the case and a statement of its results will be prepared, which will be published with remarks. This condensed history may be written by the reporter himself, or it can be prepared from his notes.

In the next number of the Journal it is proposed to publish plans for taking cases, in order that they may be more readily classified and compared, and the facts registered with as little trouble as possible.

In this part of the undertaking I shall receive most valuable help from my friend, Dr. John Ogle, who has very kindly offered to assist me in the work. It is anticipated that this department of the Journal will gradually become of considerable extent, and by following out the plan of grouping the cases as soon as possible, and forming a classified index, it is hoped that ready reference, which can alone render the clinical reports useful to the profession, will be ensured, while at the same time every fact of any importance will have due prominence given to it. The classification will not be postponed until a great number

of cases have accumulated, but will be proceeded with as they arrive.

Each volume of the "Archives" will be complete in itself, with Table of Contents and full Index, and from time to time classified Tables of the Contents of all the numbers will be made out.

The communications published in this volume have been arranged under the following heads:—

I. Clinical observations.

II. Original Researches in Anatomy and Physiology, and Morbid Anatomy and Pathology.

III. Results of the chemical and microscopical examination of the solid organs and secretions in a healthy and morbid state.

IV. Processes and instruments of practical value in carrying out Scientific Inquiries bearing upon medicine.

V. Condensed reports of researches published elsewhere.

Every contributor is entitled to receive 12 *copies of his paper.* Several authors of papers have expressed a desire to be furnished with a greater number of copies than 12. The arrangements for reprinting separate copies of papers are always complicated, expensive, and troublesome, but as I am fully conscious of the great convenience of these separate copies to the authors, I have arranged with Messrs. Harrison to supply them on certain conditions, and on the following terms:—

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3. *The Editor begs that all copies may be paid for* WHEN ORDERED, *as he cannot ask Messrs. Harrison to keep small accounts.*

*** All applications for extra copies must be made to the Editor as soon as the paper is in type.

It is not proposed to admit into the "Archives" any correspondence or merely controversial communications, but the pages of the Journal are open to scientific papers advocating or opposing any doctrines. The author of each paper is alone responsible for the facts and opinions brought forward, but the editor does not undertake to have published every communication which is sent to him. If not suitable to the Journal, from its great length, or from other causes, it will be at once returned to the author.

It must be admitted that the amount of letter-press, compared with that of many English and foreign journals, is small, but it is believed that this is more than compensated for by the plates, which are more numerous than in any other journal I am acquainted with. I believe that the usefulness and practical value of any work which treats of the minute anatomy of healthy and diseased structures, are directly proportioned to the number of illustrations it contains.

Drawings have therefore been made to take the place of description as far as possible, and all statements with regard to the size of objects have been altogether superseded by a plan which has answered exceedingly well. I cannot too strongly recommend this method to the attention of all who are engaged in microscopical observations.* The present volume is illustrated with thirty-two plates, and it is hoped that ere long the principle of free illustration will be carried to a still greater extent.

Some irregularity has occurred in the time of appearance of the numbers, which I very much regret. Still, in each year, two numbers have been issued, as originally proposed. I fear that at present it will not be possible to promise the numbers by a certain day, for contributors are often prevented by numerous engagements from completing their researches at the time they anticipated, and very frequently the engravings have not been finished until some time after they were promised. It is, however, expected that as the Journal becomes better supported and more widely known, it will appear regularly on the 1st of October and on the 31st of March. Its utility would be much enhanced, and probably its sale increased, if it appeared quarterly instead of half-yearly, but at present such an extension is not warranted. It is hoped that the number of annual subscribers will soon be sufficient to enable me to increase the resources of the Journal very considerably. The present volume must only be looked upon as a commencing effort, and I earnestly trust that gradually every department will be much expanded and the utility of the work increased.

LIONEL S. BEALE.

March 31st, 1859.

* The method is described in page 3. When the observer has once ascertained the magnifying power of each object-glass, and prepared scales of 100ths and 1000ths of an inch, which takes perhaps two hours, he need never again measure the diameter of any object; in fact, every object he has delineated can be measured at any time by the scale appended to his drawing.

ADVERTISEMENT TO No. I.

THE earlier years of professional life should be devoted as much as possible to the acquisition of those branches of learning which are likely to make men sound thinking practitioners,—to the storing up of facts, and to the study of principles which may be of use throughout life,—to the investigation, and if this may be, to the discovery of new truths from which fresh researches will proceed. In this way Harvey, and Hunter, and Bell, and Astley Cooper, and many other distinguished practical physicians and surgeons passed the early, and not the early years only, of their professional life. Their labours prove that valuable scientific research is not incompatible with very active professional duties, and may be carried out by those who at the same time are engaged in practice, or are pursuing clinical work in Hospitals and Dispensaries.

Even if it were certain that in our own time no practical gain in relieving suffering would be derived from scientific investigation, the want of results would be a very bad argument for abandoning our researches, seeing how many of the principles which we follow in the treatment of disease, are based upon the results of the scientific labours of those who have preceded us. It may surely be regarded as equally certain that scientific truths worked out in our own time will prove of real practical utility, if not to us, at least to our successors.

In England, such investigations are almost entirely left to the members of our profession; and perhaps no education is better adapted to produce scientific investigators than that of the student of medicine. Compelled to study many branches of physical science, and accustomed to apply theoretical problems to practical ends, at the conclusion of his career as a student, he is in a position to select for himself that path of original investigation which his natural taste, and perhaps various accidental circumstances, seem particularly to point out to him, and in which earnestness, industry, and patience, will surely enable him to be of good service.

It has long been my hope to be able to publish, from time to time, reports of the work done in my laboratory and micro-

scope room; but as this idea approached its fulfilment, I was led to form a more extended plan, and at length determined to ask for the help and co-operation of those who, like myself, are pursuing investigations bearing more or less directly upon medicine. Quite sure of receiving encouragement from many fellow-labourers, and fully conscious of a growing feeling in the profession of the real value and ultimate practical utility of scientific inquiry in the diagnosis and treatment of disease, I look forward with pleasure to the task of editing the "Archives," and shall feel thankful to friends who will give me any hints which are likely to increase the usefulness of the work.

The opinion has been expressed, that a journal devoted to original researches and scientific investigations, in connection with medicine, would receive support; but to make many of the subjects really intelligible, the papers must be freely illustrated. I have, through the assistance of Messrs. Harrison, been able to adopt a plan, not often followed, by which illustrations may be introduced, at comparatively small cost.

It has been considered the best course to publish the first number before applying for communications, in order that some idea of the general nature of the Journal may be formed by those whose support is so much desired. I have, however, received communications and cases from a few friends, to whom my thanks are specially due for this early help.

I shall introduce copious illustrations, feeling confident that drawings are really of much more use than long descriptions. I am anxious that the text should be as short as is compatible with a clear statement of the facts; and it is my desire, as far as possible, to substitute accurate representations of the objects for a minute description of their characters.

Each number will contain from *four to eight octavo pages* of *lithographs* besides several *woodcuts* inserted in the text. The illustrations will be accurate and drawn to a scale, but they will make no pretensions to artistic excellence. It is hoped, however, that their number will be progressively increased and their character improved. I shall be happy to receive suggestions and contributions for future numbers.

Every contributor will receive 12 *copies of his communication, free of expense.*

LIONEL S. BEALE.

October 1*st*, 1857.

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Apparatus required in Microscopical Investigation.

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THE USE OF THE MICROSCOPE IN PRACTICAL Medicine, by Lionel Beale, M.B., F.R.S., Second Edition, almost re-written, and much enlarged, 270 Wood Cuts, and a Coloured Plate.

SPECIMEN OF CUTS.

PREFACE TO THE SECOND EDITION.

"The Author has endeavoured to increase the usefulness of the work, and render it as practical as possible. With this view it has been revised throughout, and many of the articles have been entirely re-written. Much that related merely to manipulation in the first edition, will be found in "How to Work with the Microscope," and has, therefore, been omitted in the present one. In place of this, much matter bearing more exclusively upon Medicine has been introduced, and upwards of sixty new and original woodcuts have been inserted.

LONDON: JOHN CHURCHILL.

TABLES FOR THE EXAMINATION OF URINE.

The paragraphs referred to in this Work correspond to those in the *first Edition* of

The Microscope in its Application to Practical Medicine.

The following Table shows the corresponding Paragraphs to be consulted in the Second Edition just published.

Old Edition.		*New Edition.*	*Old Edition.*		*New Edition.*
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PROSPECTUS

OF

KING'S COLLEGE, LONDON.

JULY 20, 1860.

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FULL PARTICULARS UPON ALL SUBJECTS CONNECTED WITH THIS COLLEGE MAY BE OBTAINED FROM THE "KING'S COLLEGE CALENDAR." THIS BOOK MAY BE PROCURED AT THE SECRETARY'S OFFICE, PRICE 2*s.* 6*d* OR IT WILL BE SENT BY POST, ON REMITTING THREE SHILLINGS IN STAMPS TO J. W. CUNNINGHAM, ESQ., KING'S COLLEGE, LONDON. W.C.

LONDON:
PRINTED BY R. CLAY, BREAD STREET HILL.

King's College, London.

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N.B.—The next day fixed for the Examination of Candidates for admission into this Department, is Wednesday, October 3, 1860.

KING'S COLLEGE, LONDON.

Theological Department.

The object in view in this Department of King's College is to provide a system of sound Theological Instruction, essentially practical in its nature, for the large and important class of young men who propose to offer themselves as Candidates for Holy Orders.

This department is under the immediate superintendence of the Principal of King's College, who lectures twice in each week on the 39 Articles, and is conducted by

The Rev. A. McCaul, D.D. . . .	Professor of the "Exegesis of the Old Testament."
	Professor of "Hebrew and Rabbinical Literature."
	Professor of "Ecclesiastical History."
The Rev. C. J. Ellicott, B.D. . .	Professor of the "Exegesis of the New Testament."
The Rev. E. H. Plumptre, M.A.	Professor of "Pastoral Theology."
The Rev. J. J. S. Perowne, M.A.	Lecturer in "Divinity," including "the Evidences."
	Lecturer in "Hebrew and Rabbinical Literature."
John Hullah, Esq.	Professor of "Vocal Music."
Rev. A. S. Thelwall, M.A. . . .	Lecturer in "Public Reading."

The superintendence of the Choir is entrusted to W. H. Monk, Esq.; and the Lectures on Public Health are given by W. A. Guy, Esq. M.B. Cantab.

The course of Instruction in this Department embraces the Evidences of Natural and Revealed Religion; the Holy Scriptures in the Original Languages; the Thirty-nine Articles of Religion; the Book of Common Prayer; Ecclesiastical History, both Ancient and Modern; and the theory and practice of the Pastoral Office, including the reading of the Liturgy, and the composition and delivery of Sermons. Measures also are taken for providing the Students with the opportunity of acting as District Visitors under the Parochial Clergy, and also for enabling them to become practically acquainted with the best methods of conducting Schools. A course of eight Lectures on Public Health, in all its bearings, is given in the Lent Term of each year. Instruction is also given within the College in the theory and practice of Congregational Singing.

The following persons are admitted Students of this Department:—

1. All Students of King's College, London, who, having passed three years in the Department of General Literature and Science, and fulfilled the required conditions, shall have received the Diploma of an Associate.

2. All Graduates of the Universities of Oxford, Cambridge, and Durham.

3. All persons of the age of twenty-one, who, after having been examined and reported as eligible by the Principal, shall obtain the recommendation of a Bishop. The necessary qualifications are, the Four Gospels in Greek; a knowledge of the Historical Books of the Old Testament; a thorough acquaintance with the Church Catechism, with Scripture proofs; a* *grammatical* knowledge of some one Greek, and some one Latin Classical book, which may be selected by the Candidate himself; Latin and Greek Grammar; and Bacon's Essays. An acquaintance with a small pamphlet (Initia Hebraica) of four pages on the Hebrew Alphabet, by the Rev. A. M'Caul, D.D., is also expected; this may be purchased at the Secretary's Office, King's College, price 6*d.*, or by post 7*d.*

Associates of King's College, London, and Graduates of Oxford, Cambridge, or Durham, will be admitted on producing testimonials from their respective Colleges; and every other Candidate must send to the Principal, seven days previous to the examination, a written application for admission, accompanied by a certificate of good moral and religious character from the Clergyman of his parish, or of the parish in which he has last resided. The names of one or more friends to whom the Candidate is well known, must also be given as Referees. The form of application may be obtained by application to the Secretary.

Previously to Matriculation each Student must subscribe the Thirty-nine Articles of Religion, as well as a declaration that he will conform to all the rules and regulations of the College.

Persons already in Deacons' Orders, desirous of preparing themselves as Candidates for Priests' Orders, as well as Graduates of Oxford, Cambridge, and Durham, are permitted to attend the Theological Course for such length of time as they may desire; but, in the case of all other Students, the Course of Study must be continued during at least Six Academical Terms (two years). Examinations take place in each of the several branches of instruction every Term, and a probationary *vivâ voce* must be passed by every Student in his fourth or fifth Term. At the close of the course of two years a strict examination takes place; and to all Students who have merited such a distinction by their attainments, and by their good character during the period of their Studies in King's College, the Principal is empowered by the Council to grant a Certificate of attainments, which may be exhibited for the satisfaction of that Bishop to whom any Student may apply to be admitted as a Candidate for Holy Orders.

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* The choice of books to be brought up is to be made from the following List:—

HOMER.—Books I. II. III.
ONE GREEK TRAGEDY.
HERODOTUS.—Book II., or any two other Books.
THUCYDIDES.—One Book.
XENOPHON.—"Cyropædia." Books I. II. III.
———— "Anabasis." Books I. II. III.
CICERO.—"De Officiis."
———— "De Natura Deorum."
CICERO.—"De Finibus."
CÆSAR.—"De Bello Gallico." Three Books.
SALLUST.
LIVY.—Two Books.
TACITUS.—"De Moribus Germanorum," and "Agricola."
VIRGIL.—Three Books of the Æneid, or the Georgics.
HORACE.—The Odes; the Satires; or the Epistles.

The two Archbishops and twenty-four of the Bishops have consented to admit as Candidates for Holy Orders those Students who shall produce the College Certificate. The Bishops of Bangor and Ely, *for local reasons only*, do not recognise the College Certificate.

The Board of Examiners hold examinations for Certificates at the *end* of the Michaelmas, Lent, and Easter Terms.

The Fees for attending the full prescribed Course are 8*l.* 8*s.* per Term for Graduates of Oxford, Cambridge, and Durham; 10*l.* 10*s.* per Term for all Associates of King's College, London; and 12*l.* 12*s.* per Term for all other Students. The Fees for the first two Terms must, except by special permission, be paid upon entrance, in addition to the following: viz.—

Matriculation Fee, including Library	£3 3 0	Associates of King's College, London, are not liable to this charge.
Cap and Gown	1 10 0	
The Calendar	2 6	
	£4 15 6	

The Academical Year consists of Three Terms; viz.—

Michaelmas Term, from about the 1st of October to the week before Christmas.

Lent Term, from about the 20th of January to the week before Easter.

Easter Term, from about ten days after Easter to the end of June.

OCCASIONAL STUDENTS.

Gentlemen not wishing to attend the whole Course, may select any one or more subjects, at the following Fees:—

		Fees per Term. £ s. d.	Per Year. £ s. d.
Ecclesiastical History	Rev. A. M'Caul, D.D.	4 4 0	10 10 0
Exegesis of the Old Testament and Hebrew	Rev. A. M'Caul, D.D.	4 4 0	10 10 0
Exegesis of the New Testament	Rev. C. J. Ellicott, B.D.	4 4 0	10 10 0
Pastoral Theology and the Acts of the Apostles	Rev. E. H. Plumptre, M.A.	4 4 0	10 10 0
Public Reading	Rev. A. S. Thelwall, M.A.	2 2 0	5 5 0
Vocal Music	John Hullah, Esq.	1 1 0	2 12 6
Public Health	W. A. Guy, Esq. M.B.	1 1 0	

RESIDENCE IN COLLEGE.

Residence is provided within the College precincts for a limited number of Students.

Terms.—The amount to be paid for residence varies, according to the position of the rooms, from £50 to £60 per annum; in which amount is included the whole expense of, rent for furnished rooms, and attendance throughout the year; Coals, during the Michaelmas and Lent Terms; and Dinner in the College Hall, during the time that lectures continue. See page 21.

CLASS OF CANDIDATES FOR ADMISSION INTO THE THEOLOGICAL DEPARTMENT.

With the view of preparing those gentlemen who are not yet qualified to pass the examination for admission into the Theological Department, a Class is established, in which instruction in the Latin and Greek Languages is given daily. The elements of Hebrew are also taught.

Lecturer in Divinity.

Rev. Alexander I. McCaul, B.A.

Any person, twenty years of age, may enter this Class for such length of time as he may desire, upon producing a Certificate of good moral conduct from the Clergyman of the last place in which he has resided.

The instruction given varies according to the proficiency of each Student; but all Students of this Class are required to attend the Chaplain's Lecture on Thursday and Saturday.

Hours of attendance, from ten to two daily.

The Fees amount to £8 8*s.* per Term, which sum covers every expense, except the Entrance Fees, which are £4 15*s.* 6*d.*, as in the Theological Department. Upon joining that Department, the Student will not have to pay the Entrance Fees again.

N.B. The next day fixed for the admission of new Students, is Tuesday, October 2, 1860.

KING'S COLLEGE.

LONDON.

Department of General Literature and Science.

This Department is intended to prepare Students for the Universities, for Holy Orders, for the Bar and other professions, and for competition for appointments in the Civil Service of her Majesty's Government, and of the Honourable East India Company.

The regular Course of Education comprises—

Religious Instruction, according to the principles of the United Church of England and Ireland, by the Rev. R. W. Jelf, D.D. Principal, and the Rev. E. H. Plumptre, M.A. late Fellow of Brasenose College, Oxford.

The Greek and Latin Classics, by the Rev. R. W. Browne, M.A. late Fellow and Tutor of St. John's College, Oxford, Professor; C. H. O. Daniel, Esq. B.A. Scholar of Worcester College, Oxford, Lecturer; and the Rev. J. J. Heywood, M.A. of Trinity College, Cambridge, Assistant Lecturer.

Mathematics, by the Rev. T. G. Hall, M.A. late Fellow and Tutor of Magdalene College, Cambridge, Professor; the Rev. T. A. Cock, M.A. of Trinity College, Cambridge, Lecturer; and Rev. W. Howse, M.A. of St. John's College, Cambridge, Assistant Lecturer.

Modern History, by C. H. Pearson, Esq. M.A. Fellow of Oriel College, Oxford, Professor.

The English Language and Literature, Composition, &c. by the Rev. J. S. Brewer, M.A. of Queen's College, Oxford, Professor.

French Literature and Language, by Alphonse Mariette, M.A. Professor, and Léonce Stievenard, Lecturer.

German Literature and Language, by Adolphus Bernays, Ph.D. Professor.

The Fees for Matriculated Students, *i.e.* for those who are admitted to the regular and prescribed course of Study, amount to 11*l.* 5*s.* per term. The Fees for the first two terms are paid upon Matriculation, in addition to the following:—

£3	3	0	..... Matriculation, including Library Subscription.
1	10	0	..... Cap and Gown.
0	2	6	..... The Calendar.
£4	15	6	

Previously to Matriculation, Students are required to produce a testimonial of good conduct from their last instructor, and to subscribe a declaration, that they will conform to all the Rules and Regulations of the College.

Except in special cases, no one is admitted under sixteen years of age.

Chapel.—The duties of the day commence with Prayers in the Chapel, at Ten o'Clock precisely. The presence of all Matriculated Students is required. A register of their attendance is kept.

The Academical Year consists of *Three Terms*; viz. *Michaelmas Term*, from the beginning of October to the week before Christmas; *Lent Term*, from the middle of January to the week before Easter; *Easter Term*, from Easter to the beginning of July.

Examinations.—There are Examinations at the end of the Michaelmas and Easter Terms when the Students are classed according to their proficiency. The Examination at the close of the Academical Year is followed by a public Distribution of Prizes.

Scholarships. The following are given every year in this Department:—

One of £50 every year, in Modern History.
One of £50 „ in English Literature. } See next page.
One of £40 „ in Classics, and one of £40 in Mathematics, for two years.
One of £30 „ „ and one of £30 in ditto.
One of £20 „ „ and one of £20 in ditto.
One of £30 „ in Divinity, (open to other Departments).

Students who have pursued their Studies in this Department of the College for three years, and have fulfilled the required conditions, are entitled, under rules laid down in the Calendar, to the Diploma of "Associate of King's College." This privilege is also extended to all Students who have passed through a Course of *two* years' study at the College, if they have previously passed *two* years either in King's College School, or in one of the Schools in Union, and had passed at least one term in the highest form of that School before leaving it.

Students of this Department, who have obtained the Diploma of "Associate of King's College," are entitled to enter the Theological Department, with the view of becoming Candidates for Holy Orders.

Dinner is provided in the College Hall every day at 6 o'clock for such Students as may wish to avail themselves of that accommodation.

Residence of Students.—Rooms are provided within the walls of the College for the residence of a limited number of Matriculated Students. The Censor of the College lives within its walls, and to him is committed by the Council the superintendence of all resident Students under academical discipline. See page 21.

Some of the Professors, &c. receive Pupils into their houses. See p. 22.

The different Classes in this Department are likewise open to Gentlemen who, being unable to attend the whole course, may wish for the opportunity of studying any particular subject. The following are the Fees for admission to separate Courses:—

		Term. £	s.	d.	Per Ann. £	s.	d.
Classical Literature	Profes. Rev. R. W. Browne	4	4	0	10	10	0
Mathematics	Profes. Rev. T. G. Hall	4	4	0	10	10	0
Modern History	Profes. C. H. Pearson	2	2	0	5	5	0
English Language, Composition, &c.	Prof. Rev. J. S. Brewer	2	2	0	5	5	0
Hebrew Language	Profes. Rev. A. M'Caul, D.D.	2	2	0	5	5	0
Sanscrit, &c.	Profes. D. Forbes	4	4	0		—	
Modern Greek	G. W. Leitner, Esq.	4	4	0	10	10	0
Turkish	G. W. Leitner, Esq.	4	4	0	10	10	0
Arabic	G. W. Leitner, Esq.	4	4	0	10	10	0
French Language	Profes. Mariette	2	2	0	5	5	0
German Language	Profes. Bernays	2	2	0	5	5	0
Italian Language	Profes. Pistrucci	2	2	0	5	5	0
Spanish Language		2	2	0	5	5	0
Chinese Language	Profes. Summers	5	5	0		—	
Drawing and Perspective	Professor De La Motte	2	2	0*	5	5	0*
		4	4	0†	10	10	0†
Law	Professor Stephen						
Library Fee			—		1	1	0

* For Matriculated Students. † For Occasional Students.

HOURS OF ATTENDANCE.

The duties of the day commence with prayers in the Chapel at Ten o'clock precisely, when the attendance of all Students is required.

	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Classics Mathematics	10½...1	10½...1	10½...1	10½...1	10½...1	—
Divinity	—	—	1¼...2	—	—	10½...12½
English Language	1¼...3¼	1¼...3¼	—	1¼...3¼	1¼...3¼	—
Modern History	1¼...3¼	1¼...3¼	—	1¼...3¼	1¼...3¼	—
French	3¼...4¾	—	—	3¼...4¾	—	—
German	—	3¼...4¾	—	—	3¼...4¾	—
Hebrew	—	—	3...4	3...4	—	—
Italian	9...10	—	—	9...10	—	—
Chinese	—	3½...5	3½...5	—	3½...5	—
Modern Greek	—	3...4	—	3...4	—	—
Turkish	—	4...5	—	4...5	—	—
Arabic	—	5½...6½	—	5½...6½	—	—
Fencing	2...4	—	—	—	—	—
Landscape Drawing	8½...10	—	—	8½...10	—	—

N.B. The next day fixed for the admission of new Students, is Tuesday, October 2, 1860.

KING'S COLLEGE, LONDON.

Department of General Instruction in the Applied Sciences.

I.—ENGINEERING SECTION.

INCLUDING ENGINEERING, PRACTICAL SURVEYING AND LEVELLING, MANUFACTURING ART AND MACHINERY, &c.

The object of this Section is to provide a system of general instruction, essentially practical in its nature, for the large and important class of young men hereafter to be engaged in Civil and Military Engineering, Surveying, Architecture, and the higher branches of Manufacturing Art.

The whole course thus occupies three years, and forms an appropriate introduction to that kind of instruction which can only be obtained within the walls of the manufactory, or by actually taking part in the labours of the Surveyor, the Engineer, or the Architect.

Museums, containing important and valuable collections, illustrating the subjects taught, are open to the Students.

Students who have passed two years in this Department, and, in addition, not less than one year in practice under a Civil or Mechanical Engineer, are, by a special order of the Secretary of State for India in Council, admitted to be Candidates for appointments to the Engineer Establishment in India.

The course of instruction comprises those branches of knowledge which form the groundwork of a liberal education. The following are the subjects taught in this Section:—

RELIGIOUS INSTRUCTION,

According to the principles of the United Church of England and Ireland, by the Chaplain, the Rev. E. H. Plumptre, M.A. late Fellow of Brasenose College, Oxford.

MATHEMATICS.

Professor—Rev. T. G. Hall, M.A.

Lecturers—Rev. T. A. Cock, M.A., and Rev. W. Howse, M.A.

First Year.—Arithmetic; Algebra; Euclid, Books 1, 2, 3, 4, 6, 11; Plane Trigonometry and Logarithms.

Second Year.—Conic Sections; application of Algebra to Geometry; the Differential and Integral Calculus.

Third Year.—Spherical Trigonometry; Geometry of three dimensions; Differential Calculus.

NATURAL PHILOSOPHY AND ASTRONOMY.

Professor—James Clerk Maxwell, Esq. M.A.

The object of these Lectures is to teach the principal Mechanical Sciences—namely, Statics, Dynamics, Hydrostatics, Pneumatics, and Hydraulics, together with Optics and Astronomy.

The instruction given in the first year requires no mathematical knowledge on the part of the Student, the method of solving problems by Construction being adopted.

In the second and third years the Mathematical principles of Mechanics, Hydrostatics, Optics, and Astronomy are taught, including the Theory of Work, the Mathematical Calculations relating to Roofs, Arches, Chain Bridges, Embankments, Strength of Materials, &c. together with the Constructions and use of Optical and Astronomical Instruments.

CHEMISTRY.

Professor of Chemistry—W. A. Miller, M.D. F.R.S.

Professor of Practical Chemistry—C. L. Bloxam, Esq.

Demonstrator—E. A. Hadow, Esq.

Students of the First and Second Years are admitted to the Course of Theoretical and Applied Chemistry. The Course commences with a View of the Forces which con-

to the production of Chemical Phenomena, after which the laws of Chemical Affinity are discussed, and the Non-metallic Elements and their principal Compounds are described.

The Metals and their principal compounds are next examined, care being taken to point out the applications of the Science to the Arts; and the processes of the different Manufactures, of Metallurgy, and of Domestic Economy, are explained and illustrated.

Examinations of the Class, both *vivâ voce* and by written papers, are held at intervals during the course at the usual Lecture hour. Dr. Miller has published a work on Chemistry, which is used as a text-book by the Class.

THIRD YEAR.—Students who have completed six Terms in this Department are admitted to a Course of "Practical Chemistry," consisting of Twelve Demonstrations in each term; and they go through a course of Manipulation in the most important operations of Chemistry, including the first steps of Analysis.

Any Student of this Department may be admitted to this Class at any period of his study, on payment of an extra fee. See p. 12.

EXPERIMENTAL AND ANALYTICAL CHEMISTRY IN THE LABORATORY.—The object of this Class is to afford to Students who are desirous of acquiring a knowledge of analysis, or of prosecuting original research, an opportunity of doing so under the superintendence of the Professor and Demonstrator; Students may enter, upon payment of the extra Fees, at any time except during the vacation, and for a period of one, three, six or nine months, as may best suit their convenience. The laboratory hours are from ten till four daily, except Saturday, on which day the hours are from ten till one.

In addition to the Laboratory Fee, each Student defrays the expenses of his own Experiments. The amount of this expense, which is comparatively trifling, is entirely under his own control.

GEOLOGY.

PROFESSOR—JAMES TENNANT, ESQ. F.G.S.

LENT TERM.—Descriptive Geology.

EASTER TERM.—The practical application of Geology to Engineering, Architecture, Agriculture, and Mining.

The Students are accompanied by the Professor to the Museum of Economic Geology, the British Museum, and other public institutions, and also on excursions into the country.

ARTS OF CONSTRUCTION IN CONNEXION WITH CIVIL ENGINEERING AND ARCHITECTURE.

PROFESSOR—W. HOSKING, ESQ.; LECTURER—ANDREW MOSELEY, ESQ.

This Course, intended for Students of the second and third years, includes a descriptive account of the various Arts and Operations employed in Hydraulic Architecture or Engineering, and also of those employed in the ordinary practice of Civil Architecture;—Navigators', Bricklayers', Masons', Carpenters', Smiths' Work, &c.;—the matters acted upon,—the terms used,—the tools, implements, and materials employed, and the modes of operating with or upon them;—the combinations effected, and the modes of effecting them in detail:—Cutting and Embanking,—the Formation and Construction of Drains and Sewers, Shafts, Driftways, Tunnels, Canals, Reservoirs, Water Works, Roads, Bridges, Railways, Docks, Harbours, &c. &c.

The Course will also include Instruction in Specifying, Estimating, and Measuring Work, and in the practice of Architectural Surveying generally.

Any Student of this Department may be admitted to this class at any period of his study, on payment of the usual fee.

MANUFACTURING ART & MACHINERY.

PROFESSOR—C. P. B. SHELLEY, ESQ.

The Lectures and Instructions in this section are intended to familiarize the student with the Machinery and contrivances in actual use; thus adding a knowledge of practice to the knowledge of theory taught by the Professors.

To effect this object, machines are not only described in general terms, but their various details, and the design of each particular construction, are explained and illustrated by drawings or models.

The most important manufacturing processes are also explained and amply illustrated in the course.

VISITS OF THE STUDENTS TO MANUFACTORIES, ETC.

Access to some of the principal Manufacturing Establishments in the metropolis, and its vicinity, having been liberally granted to the Students of this department of King's College, they are accustomed to visit them from time to time, accompanied by the Professor on Manufacturing Art and Machinery: they thus see in operation the manufacturing processes which have formed the subject of their Lectures, the mechanical expedients which concur to the production of each are explained, and the economy of the whole is pointed out on the spot.

ENGINEERING WORKSHOPS.

SUPERINTENDENT—G. A. TIMME, ESQ.

Workshops have been fitted up, with engines, lathes, forges, benches, and all necessary implements for enabling the Students to become practically familiar with the Use of Tools, and the Construction of Models. At certain hours the Students are admitted, and a regular course of instruction is given, beginning with the simplest kinds of work and gradually proceeding to the construction of models of Apparatus and Machinery.

In addition to the Superintendent, experienced workmen are in attendance at regular hours.

GEOMETRICAL DRAWING AND DESCRIPTIVE GEOMETRY.

PROFESSOR—THOMAS BRADLEY, ESQ.

LECTURER—FREDERICK ALFRED BRADLEY, ESQ.

This Course comprehends Practical Geometry in the most extensive sense of the term.

1. PLANE GEOMETRY, the delineation of plane figures and curves, and, generally, the solution of all the Problems required in the practical Arts; the use of Drawing Instruments, &c.

2. SOLID, or DESCRIPTIVE GEOMETRY, including PROJECTION, ISOMETRICAL PROJECTION, PERSPECTIVE, the construction of MAPS, LIGHT and SHADE, and DRAWING, in the common acceptation of the term, as connected with the objects of this Department.

LANDSCAPE DRAWING AND COLOURING, AS APPLIED TO ARCHITECTURAL DESIGNS.

PROFESSOR—PHILIP H. DE LA MOTTE, ESQ. F.S.A.

This Class is limited to Students of the third year, who have the option of attending it *instead* of Geometrical Drawing.

MINERALOGY.

PROFESSOR—JAMES TENNANT, ESQ. F.G.S.

The Course commences with a description of the Physical and Chemical characters of Minerals in general.

The principal simple Minerals are next separately considered, and the readiest mode of distinguishing them described.

The course of instruction includes a minute description of all the substances entering into the composition of Rocks, and of those minerals which are also used in the Arts; illustrated by an extensive collection of characteristic specimens, and diagrams of the principal crystalline forms, &c.

PRACTICAL SURVEYING AND LEVELLING.

LECTURER—HENRY JAMES CASTLE, ESQ.

This Course is at once theoretical and practical: in the College, it embraces the various in-door details of a Surveyor's Office; and in the field, the uses and application of the several Surveying Instruments which are now in use on *Civil and Military* Surveys in England, India, and the colonies. It also includes the Theory and Practice of Levelling, the making of Sections from the Field-Books, and all the requisite practical detail before getting out the working drawings and letting the contracts; and generally, such information, both theoretical and practical, as will qualify the Student to enter at once as Draughtsman into an Engineer's Office.

THE ART AND SCIENTIFIC PRINCIPLES OF PHOTOGRAPHY.

LECTURER—THOMAS FREDERICK HARDWICH, ESQ.

Arrangements are now made for a complete Course of Instruction in Photography in King's College. A glass house, with commodious developing rooms, has been erected, and in connexion with it a Laboratory for the preparation of Photographic Chemicals. Students entering to this Department will be afforded every facility for practising the Art in all its branches.

In addition to the regular College Course in Photography, occasional Classes are formed, consisting each of about six gentlemen, who meet twice a week. Ten Lectures are given of two hours each, for which the fee is £3 3*s*., to be paid in the Office of the College. The fee for Private Instruction is £5 5*s*. for six Lessons, or £10 10*s*. for perpetual attendance.

THE ADMISSION OF STUDENTS.

Previously to Matriculation, Students are required to produce a testimonial of good conduct from their last instructor, and to subscribe a declaration, that they will conform to all the Rules and Regulations of the College. Every Student, after obtaining the signature of the Principal to his card of admission, is required to bring it to Professor HALL, the Dean of this Department, in order that it may be countersigned by him.

CHAPEL.—All Matriculated Students are required to attend Prayers in the Chapel at 10 o'clock precisely. A register of their attendance is kept.

The Academical Year consists of *Three Terms;* viz. *Michaelmas Term*, from the beginning of October to the week before Christmas; *Lent Term*, from the middle of January to the week before Easter; *Easter Term*, from Easter to the beginning of July.

EXAMINATIONS.—One at the end of the Michaelmas Term and another at the close of the Academical Year, at which latter there is a public Distribution of Prizes.

AGE OF ADMISSION.—Except in special cases, no one is admitted under sixteen years of age

RESIDENCE OF STUDENTS.—Rooms are provided within the walls of the College for the residence of a limited number of Matriculated Students. The Censor of the College lives within its walls, and to him is committed by the Council the superintendence of all resident Students under academical discipline. See page 21.

Some of the Professors, &c. receive Pupils into their houses. See page 22.

FEES.

The Fees payable by Matriculated Students, that is, by those who are admitted to the Regular and Prescribed Course of Study, amount to £12 17*s.* per Term. The Fees for the first two Terms must be paid upon entrance, in addition to the following:—

Matriculation Fee, including Library Subscription	£3 3 0
Cap and Gown	1 10 0
Calendar	0 2 6
	£4 15 6

The different Classes in this Department are open to any Gentlemen who may not wish to attend the whole of the Course, but who may desire to study any particular subject. The following are the Fees:—

	£ *s.* *d.*	£ *s.* *d.*
Mathematics	4 4 0 per Term	10 10 0 per Annum.
Natural Philosophy	3 3 0 ...ditto	8 8 0 ditto.
Chemistry	3 3 0 ...ditto	7 7 0 for the Year.
Practical Chemistry	1 11 6* for Terminal Course of 12 demonstrations.	
	2 2 0‖	
	4 4 0§ for Summer Course of 30 demonstrations.	
	5 5 0‖	
	8 8 0§ for perpetual attendance.	
	9 9 0‖	
Experimental and Analytical Chemistry	4 4 0 One Month.	
	10 10 0 Three Months.	
	18 18 0 Six months.	
	26 5 0 Nine Months.	
Descriptive Geology	2 12 6 for the Lent Term,	3 13 for the two Terms.
Practical Geology and Mining	1 11 6 for the Easter Term, or	
Arts of Construction, &c.	2 12 6 per Term	7 7 0 per Annum.
Landscape Drawing	2 2 0§ ditto	5 5 0§ ditto.
	4 4 0‖	10 10 0‖
Mineralogy		2 2 0 for the Course.
Geometrical Drawing	2 2 0 per Term	5 5 0 per Annum.
Manufacturing Art and Machinery	2 2 0 .....ditto	5 5 0 ditto.
Practical Surveying	3 3 0 .....ditto	8 8 0 ditto.
Workshop†	3 3 0 .....ditto	8 8 0 ditto.
Photography	3 3 0 for Ten Lessons.	

* For Students of this Department who have not kept six Terms.
§ For Matriculated Students of other Departments. ‖ For Occasional Students.
† A Fee of 11*s.* per Term is also required for the use of the Steam-engine and Machinery.

DAYS AND HOURS OF ATTENDANCE.

The duties of the day commence with prayers in the Chapel at Ten o'clock precisely, when the attendance of all Students is required.

	Monday.	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*	*Saturday.*
FIRST YEAR.						
Chemistry	—	10.15—11.15	—	—	10.15—11.15	—
Mathematics	10.15—1	11.30—1	10.15—1	10.15—1	11.30—1	—
Mechanics and Nat. Phil.	10.15—1	—	10.15—1	10.15—1	—	—
Drawing	—	—	*a*1—4	—	1—4	—
Surveying	—	—	—	—	*e*3—4	e10
Mach. and Man. Art	—	—	—	1.15—2.15	—	—
Ditto, Visit	—	—	*b*1—4	—	—	—
Mineralogy (*c*)	—	—	9—10	—	9—10	—
Geology (*d*)	—	—	9—10	—	9—10	—
Practical Geology (*e*)	—	—	9—10	—	9—10	—
Workshop (*h*)	1—4	1—4	—	—	—	—
Divinity	—	—	—	2.30—3.15	—	11
SECOND YEAR.						
Chemistry	—	10.15—11.15	—	—	10.15—11.15	—
Mathematics	10.15—1	11.30—1	10.15—1	10.15—1	11.30—1	—
Mechanics	10.15—1	—	10.15—1	10.15—1	—	—
Drawing	1—4	—	*a*1—4	—	—	—
Surveying	—	—	—	—	*f*4—5	*g*10
Mach. and Man. Art. (*o*)	—	1.15—2.15	—	—	—	—
Ditto, Visit	—	—	*b*1—4	—	—	—
Mineralogy (*c*)	—	—	9—10	—	9—10	—
Geology (*d*)	—	—	9—10	—	9—10	—
Practical Geology (*e*)	—	—	9—10	—	9—10	—
Arts of Construction (*m*)	—	4—5	—	3.30—4.30	—	—
Workshop (*h*)	—	1—4	—	—	1—4	*g* 10.15—1
Divinity	—	—	—	2.30—3.15	—	11
THIRD YEAR. *Extra Subjects.*						
Practical Chemistry (*i n*)	10.30—12.30	—	—	—	—	—
Photography (*k n*)	—	—	—	—	10.30—12.30	—
Surveying	—	—	—	—	*f*3—4	*p*10

As to other Classes, similar in all respects to Second Year Students.

a b. Alternate Wednesdays.
c. Michaelmas Term only.
d. Lent Term only.
e. Easter Term only.
f. Michaelmas and Lent Terms only.
g. On alternate Saturdays in Surveying during the Michaelmas and Lent Terms only.
h. Open from 1 to 6 daily (Saturday excepted, when it closes at 4), for such Students as have leisure for attending; but attendance required, and marked, at the hours named.
i. Twelve Lessons every Term.
k. Six Lessons every Term.
m. Open to Students of the First Year on payment of the usual fee.
n. Open to Students of the Second Year on payment of the usual fee, and by leave of the Dean.
o. Students not attending this Class on Tuesday, are to attend the Workshop from 1 to 4, and must also attend the lecture on machinery, at 1.15. on Thursday.
p. On alternate Saturdays in Levelling during the Michaelmas and Lent Terms only.

ENDOWMENTS, PRIZES, &c.

SCHOLARSHIPS.—One of £30, two of £25, and one of £20, tenable for one year.
The Divinity Scholarship of £30.
The Daniels' Scholarship of £20. (See page 18.)

PRIZES, Certificates of Approval, and Certificates of Honour, are given to those Students who most distinguish themselves at the Examinations held in June.

ASSOCIATES, &c.—Students who have pursued their Studies in this Department for Nine Terms, and who have fulfilled the conditions mentioned in the Calendar, are entitled to the Diploma of "Associate of King's College."

II.—MILITARY SECTION.

This Section of the Applied Sciences Department is intended—

A. For those Gentlemen intending, (1) to compete in the Examinations for admission into the Royal Military Academy at Woolwich; the Royal Military College at Addiscombe; or the Royal Military College at Sandhurst: (2) or to pass the Examination for Commissions in the Service of Her Majesty, either in England or in the East Indies.

B. For Officers wishing to prepare themselves for the Examination for Staff Appointments, or to compete for admission into the Royal Military College at Sandhurst.

The different Classes are conducted by the following Professors and Lecturers:—

Religious Instruction, according to the principles of the United Church of England and Ireland, by the Rev. E. H. Plumptre, M.A. Chaplain.

Mathematics, by the Rev. T. G. Hall, M.A. Professor, the Rev. T. A. Cock, M.A. Lecturer, and the Rev. W. Howse, M.A. Assistant Lecturer.

Chemistry, by Professor W. A. Miller, M.D. Professor.

Natural Philosophy, by Professor.

Mineralogy and Geology, by James Tennant, Esq. Professor.

Geometrical Drawing, by Frederick Alfred Bradley, Esq. Lecturer.

Topographical Drawing; Fortification; Military Surveying; Military Law; the Science of Artillery, by Major Griffiths, R.A. Professor.

French, by Professor Mariette, M.A. Professor, and M. Stievenard, Lecturer.

Military Tutor (*for History, Classics, &c.*), Rev. J. O'Reilly, M.A.

FEES AND HOURS OF ATTENDANCE.

Fees to Separate Classes per Term. £	s.		Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
		Divinity	...	...	...	2.30—3.15	...	...
2	2	Mineralogy and Geology.	...	...	9—10	...	9—10	...
3	3	Chemistry	...	10.15—11.15	...	...	10.15—11.15	...
3	3	(Heat and Electricity) (Natural Philosophy)	10.15—1	11.30—1	10.15—1	10.15—1	11.30—1	...
4	4	Mathematics.... (Pure / Mixed)						
2	2	Geometrical Drawing	1—3	...	1—4	...	1.15—4	...
4	4	(Topographical Drawing, Fortification, &c.)	...	1.30—3.30	...	..	...	10.15—12.30
8	8	Ditto, for Officers only	...	11—3.30	...	...	...	10.15—2.30
2	2	French	3.15—4.45	...	...	3.15—4.45	...	...
4	4	(Military Tutor's Class in History, Classics, &c.)	...	...	3.15—5	1.15—2.15	2.30—4.30	...

Fees per Term to Matriculated Students, for the Course, including Tutor's Class, 15*l.* 15*s.*; or, exclusive of the Tutor's Class, 13*l.* 13*s.* The Matriculation Fees are 4*l.* 15*s.* 6*d.* on entrance.

Fees for Officers' Class, 8*l.* 8*s.* per Term.

KING'S COLLEGE LONDON.

Medical Department.

The Students received into this Department are—

I. Matriculated Students, or those who (with certain exceptions named in the Calendar) receive their entire medical education at King's College.

Matriculated Students alone have the privilege of filling the offices of Clinical Clerks, Dressers, Dentist's Assistant, Physicians' Assistant, Physician Accoucheur's Assistant, Assistant House Physician, House Surgeon, and Assistant House Surgeon, to the Hospital; of becoming candidates for the Warneford and Medical Scholarships; and of wearing the College cap and gown. They are also admitted to the practice of the Hospital at a somewhat reduced fee.

II. Occasional Students, or those who enter to one or more particular Classes. Every Class is open to such Students, on payment of the prescribed amount of fees.

The year is divided into two Sessions. The Winter Session, beginning October 1st, terminates at the end of March. The Summer Session, beginning May 1, terminates at the end of July.

The Lectures upon the various branches of Medical Knowledge are as follows:—

Winter Session.

ANATOMY, DESCRIPTIVE AND SURGICAL.	*Professor*, Rich. Partridge, F.R.S. *Demonstrator*, J. Wood, F.R.C.S. *Assistant Demonstrators*,
PHYSIOLOGY: GENERAL AND MORBID ANATOMY	*Professor*, Lionel Smith Beale, M.B. F.R.S.
CHEMISTRY	*Professor*, W. A. Miller, M.D. F.R.S. *Demonstrator*, E. A. Hadow, Esq.
MEDICINE, PRINCIPLES AND PRACTICE OF	*Professor*, George Budd, M.D. F.R.S.
SURGERY, PRINCIPLES AND PRACTICE OF	*Professor*, William Fergusson, F.R.S.

Summer Session.

BOTANY	*Professor*, Robert Bentley, F.L.S.
MATERIA MEDICA AND THERAPEUTICS	*Professor*, George Johnson, M.D.
MIDWIFERY, AND THE DISEASES OF WOMEN AND CHILDREN	*Professor*, Arthur Farre, M.D. F.R.S.
FORENSIC MEDICINE	*Professor*, W. A. Guy, M.B. F.S.S.
PRACTICAL CHEMISTRY	*Professor*, C. L. Bloxam.
COMPARATIVE ANATOMY	*Professor*, T. Rymer Jones, F.R.S.
DENTAL SURGERY	*Professor*, Samuel Cartwright, jun.

Dean for the Year 1860-61 . . . . . Professor Johnson, M.D.

Sub-Dean and Medical Tutor . . . . . John Harley, Esq.

It is one of the duties of the Medical Tutor to assist the Students living in the College, as well as the non-resident Students, in the subjects of the Lectures of their first Winter and Summer Session.

N.B. By a recent regulation of the College of Surgeons, all candidates for the Diploma of the College, who shall commence their *Professional* Education on or after the 1st of January, 1861, will be required to pass a preliminary examination in the ordinary branches

of a liberal education, or to produce certificates from certain specified institutions of having passed a corresponding examination. For particulars see the Regulations of the Royal College of Surgeons, quoted in the Calendar.

Students who intend to graduate in the University of London are reminded that they will be required to pass the Matriculation Examination of that University at least two years before they can present themselves as candidates for any of its degrees. A certificate of having passed this examination, is admitted by the College of Surgeons and the Apothecaries Hall as a substitute for their own preliminary examinations.

ANALYTICAL AND EXPERIMENTAL CHEMISTRY.

Besides the Course of Chemical Lectures, and the Summer Class of Practical Chemistry, provision is made for those Students who wish to become more minutely acquainted with the practical details of the science. The Class formed for this purpose is conducted in the Laboratory, under the superintendence of the Professors and Demonstrator. By this means each Student will be enabled to familiarize himself with the methods of analysis and research. After passing through a preliminary course of analytical operations, each Student devotes himself to such portions of the science as are most interesting to himself, or most likely to be practically useful to him.

DENTAL SURGERY.

A Course of Lectures on Dental Physiology, Dental Surgery, and Pathology, and on Dental Mechanics, will be given during the Summer Session for those who specially enter for this Course.

Special Certificates of attendance on the Dental Practice of the Hospital will be given on payment of an extra Fee of Five Guineas.

Fees.

The College fees, in the case of *Matriculated* Students, for the lectures required by the College of Surgeons and the Society of Apothecaries, amount to 61*l.* 19*s.*; those for Hospital practice to 31*l.* 10*s.*; those for Matriculation, (including Library Fee, Calendar, and College Cap and Gown,) to 4*l.* 15*s.* 6*d.*; making together 98*l.* 4*s.* 6*d.* This sum will cover all that of necessity *must* be paid for the entire three years' Course of Study.

Students are, however, recommended to add to this sum 2*l.* 2*s.* for a second Course of Chemistry, as well as the Fee for attendance on the Medical Tutor's Class for one year; viz., 2*l.* 2*s.* for resident Students; 3*l.* 3*s.* for non-resident Students. All resident Students are required to attend the Tutor during their first year.

The fees may be paid either in one sum on Matriculation, or in two equal sums; the one at the commencement of the first Winter or Summer Session, the other, after the first Christmas vacation, not later than Jan. 21st, unless other arrangements are made at the time of entrance.

If the plan here suggested is carried out, the following will be the mode of payment.

In October.	First half of the Medical Fees	£32	0	6	
,,	First Half of the Hospital Fees	15	15	0	
,,	Medical Tutor, One Year	3	3	0	
,,	Matriculation Fees	4	15	6	
					55 14 0
In January.	Second half of Medical Fees	32	0	6	
,,	Second half of Hospital Fees	15	15	0	
					47 15 6
Total amount necessary to defray the cost of Lectures required by the College of Surgeons and the Society of Apothecaries, together with a Second Course of Chemistry and the Tutor's Fees for One Year					£103 9 6

Should any one prefer entering at once as a *perpetual Student to every Course of Instruction* given in this Department (except the Laboratories and Dental Surgery) the charge will be as follows:—

In October.	First half of Medical Fees	£38	6	6	
,,	First half of Hospital Fees	15	15	0	
,,	Medical Tutor, One Year	3	3	0	
,,	Matriculation	4	15	6	
					62 0 0
In January.	Second half of Medical Fees	38	6	6	
,,	Second half of Hospital Fees	15	15	0	
					54 1 6
Total amount necessary to defray the cost of entering, as a *Perpetual* Student, to every Course of Instruction given in this Department, except as above.					£116 1 6

The Fees for admission to the Laboratory Class are, for one month, 4*l.* 4*s.*; for three months, 10*l.* 10*s.*; for six months, 18*l.* 18*s.* &c.

Days and Hours of Attendance.

CLASS.	M.	Tu.	W.	Th.	F.	S.	HOURS.	Fee for the Sessional Course.	Fee for Unlimited Attendance.
WINTER SESSION.									
Anatomy	—	—	—	—	—	*—	9 — 10 A M.	£6 6 0	£9 9 0
Chemistry	—		—	—		—	10½— 11¼	7 7 0	9 9 0
Physiology	—		—	—	—		4 — 5	6 6 0	9 9 0
Medicine		—				—	4 — 5	7 7 0	7 7 0
				—			5 — 6		
Surgery	—		—		—		5 — 6	5 5 0	7 7 0
The Chaplain's Lecture					—		10¾— 11		
†Tutor's Class	—	—	—	—	—	—	3 — 4	3 3 0	
SUMMER SESSION.									
Midwifery	—		—	—	—		9 — 10	6 6 0	6 6 0
Comparative Anatomy	—		—		—		12 — 1	3 3 0	4 4 0
Botany	—	—		—	—		12½— 1½	3 3 0	4 4 0
†Practical Chemistry	—	—	—	—	—	—	10½— 12	‡4 4 0	‡8 8 0
Forensic Medicine	—	—	—		—		3 — 4	3 3 0	4 4 0
Materia Medica	—		—	—	—		8 — 9	4 4 0	6 6 0
Morbid Anatomy		—					4 — 5	2 2 0	
Dental Surgery		—			—		9 — 10	6 6 0	8 8 0
†Tutor's Class	—	—	—	—	—		9 — 10	3 3 0	
BOTH SESSIONS.									
Chapel	—	—	—	—	—	—	10		
The Principal's Lecture			—		—		1¼— 2		

* Anatomy of the head and Neck. See Reg. of Coll. of Surg. for Dent. Surg.
† Half the Class attends three days alternately. ‡ To Matriculated Students.

King's College Hospital.

Consulting Physicians. Thos. Watson, M.D. F.R.S. / Robert Ferguson, M.D.

Physicians.
- George Budd, M.D. F.R.S. / George Johnson, M.D. / Lionel S. Beale, M.B. F.R.S. — With care of In-Patients.
- W. A. Guy, M.B. F.S.S. — With care of Out-Patients.
- Arthur Farre, M.D. F.R.S. — For Diseases of Women and Children, and Physician-Accoucheur.

Assistant-Physicians.
- Charles Murchison, M.D.
- Conway Evans, M.D.
- Alfred B. Duffin, M.D.
- E. Symes Thompson, M.B.
- Thomas H. Tanner, M.D. / Alfred Meadows, M.D. — For diseases of Women and Children.

Surgeons.
- W. Fergusson, F.R.S. / Richd. Partridge, F.R.S. / Wm. Bowman, F.R.S. — With care of In-patients.
- Henry Lee, F.R.C.S.

Assistant-Surgeons. John Wood, F.R.C.S. / John W. Hulke, F.R.C.S. — With care of Out-patients.

Surgeon-Dentist. S. Cartwright, jun.

The Resident Officers, Clinical Clerks, Dressers, &c. are selected by *examination* from among those *Matriculated* Students of the College who are Pupils of the Hospital. No Fee is paid for any of these appointments.

DAYS AND HOURS OF ATTENDANCE.

	M.	Tu.	W.	Th	F.	S.	HOURS.	CLINICAL LECTURE.
Dr. Budd	—		—		—		1½ p.m.	Every alt. Monday at 1½ p.m.
Dr. Johnson		—		—		—	1½ p.m.	Every alt. Tuesday at 1½ p.m.
Dr. Beale		—		—		—	9 a.m.	Every Saturday at 9 a.m.
Dr. Arthur Farre		—		—		—	12½ p.m.	
Dr. Guy	—		—		—		1 p.m.	
Dr. Murchison (Winter Sess. only)	—		—		—		1 p.m.	
Dr. Evans (Winter Sess. only)		—		—		—	1 p.m.	
Dr. Tanner (Sum. Sess. only)		—		—		—	12½ p.m.	
Dr. Meadows (Winter Sess. only)		—		—		—	12½ p.m.	
Dr. Duffin	—		—		—		1 p.m.	
Dr. Thompson		—		—		—	1 p.m.	
Professor Fergusson		—		—		—	1½ p.m.	Every alt. Thursday at 1½ p.m.
Professor Partridge	—		—		—		1½ p.m.	Every alt. Friday at 1½ p.m.
Mr. Bowman	—		—				9 a.m.	
Mr. Henry Lee	—		—		—		1 p.m.	
Mr. Hulke (Winter Sess. only)		—		—		—	1 p.m.	
Mr. Wood (Sum. Sess. only)		—		—		—	1 p.m.	
Mr. Cartwright		—			—		10 a.m.	
Vaccination	—						10 a.m.	

FEES.

Perpetual Admission to the Medical and Surgical Practice:—
For Matriculated Students £31 10 0
For those not Matriculated 36 15 0

Medical Practice:—		*Surgical Practice:—*	
Three Months	6 6 0	Three Months	10 10 0
Six Months	10 10 0	Six Months	15 15 0
Eighteen Months	15 15 0	Twenty-one Months	21 0 0
Perpetual	21 0 0	Perpetual	26 5 0

Scholarships.

A. WARNEFORD SCHOLARSHIPS.—The sum of 200*l.* is set apart annually, in consideration of 5,000*l.* presented to the College by the late Rev. S. W. Warneford, LL.D., for Scholarships to Matriculated Students of this Department, viz.—

Class I.—"For the encouragement of the previous education of Medical Students." Two Scholarships of 25*l.* per annum, for three years.

Class II.—"For the encouragement of resident Medical Students." One Scholarship of 25*l.* per annum for two years.

B. COLLEGE SCHOLARSHIPS.—The following are given every year to Matriculated Students of this Department:—

1. One of 40*l.* for two years, open to Students of the third and fourth year.
2. One of 30*l.* for one year, open to Students of the second year.
3. Three of 20*l.* for one year, open to Students of the first year.

C. DANIELL SCHOLARSHIP.—This Scholarship was founded in honour of the late Professor Daniell, and is open to every Student of the College, whether matriculated or occasional, who has worked in the Laboratory for at least six months. It is of the annual value of 20*l.*, tenable for two years.

D. DIVINITY SCHOLARSHIP.—This Scholarship of 30*l.* is also open to Matriculated Students of this Department.

Prizes.

A. LEATHES' PRIZES.—The Interest of 300*l.* bequeathed by the late P. H. Leathes, Esq., is applied in the purchase of a Bible and Prayer-book, as Annual Prizes to two Matriculated Medical Students.

B. WARNEFORD PRIZES.—The sum of 40*l.* is set apart annually in consideration of 1,000*l.* presented to the College by the late Rev. S. W. Warneford, LL.D., and is expended in the purchase of Medals and Books, as Prizes to two Matriculated Medical Students.

C. CLASS PRIZES are awarded annually for proficiency in the several subjects of Anatomy, Physiology, Chemistry, Materia Medica, Surgery, Medicine, Midwifery, Botany, Forensic Medicine, Comparative Anatomy, and Practical Chemistry. These consist of Books of the value of 3*l.*

Certificates of Honour are given to such Students in each class as the respective Professors shall consider entitled to receive them.

Two Medical Clinical Prizes, one of 3*l.* for the Winter Session, and the other of 2*l.* for the Summer Session; and two Surgical Clinical Prizes of the same value, are given also for the encouragement of diligence in attendance at the Hospital.

All Students, *Occasional* as well as *Matriculated*, will be admitted to contend for the Class Prizes C, under rules laid down as to the number of Courses of Lectures. For particulars of all these Prizes see Calendar.

ASSOCIATES OF KING'S COLLEGE.—At the end of each Winter Session, the Professors lay before the Council the names of those Medical Students whom they recommend to be elected Associates of King's College, London. See the College Calendar. Application to be made to the Sub-Dean of the Medical Department, in writing, previous to the 31st of March in each year.

DEGREES.—Students of this College are admitted to Degrees in Arts and Medicine, and for the Honours, Exhibitions, and Scholarships conferred by the Senate of the University of London.

By a regulation of the University of Edinburgh, three out of the four years of study required by that University for its degree of M.D. may be passed at King's College.

RESIDENCE OF STUDENTS.—Rooms are provided within the walls of the College for the residence of a limited number of Matriculated Students. See page 21.

Some of the Professors, &c. receive Pupils into their houses. The Council have also sanctioned a limited number of Medical Gentlemen, residing in London or its immediate neighbourhood, to receive Pupils into their houses. See page 22.

The Parents or Guardians of Students are earnestly requested to communicate with the Dean of the Medical Department before fixing their place of residence.

DINING HALL.—There is a Dining Hall in the College, for the accommodation of the resident Students, and for such other Students as may desire to avail themselves of it.

The Sub-Dean of the Medical Department attends daily at King's College, London, from 10 A.M. to 12, for the purpose of seeing Students and their friends. Any letter addressed to him on the subject of this Department, will receive early attention.

RULES

FOR THE

WARNEFORD SCHOLARSHIPS.

THE Council hereby give notice, that the following will be the Rules under which Scholars on these Foundations will be elected—

CLASS I.

FOR THE

Encouragement of the previous Education of Medical Students.

TWO SCHOLARSHIPS, of the value of £25 per annum each, to be held for three years, and THREE SCHOLARSHIPS, of the value of £25 per annum each, to be held for two years, will be given in October, 1860, subject to the provisions hereafter stated.

Candidates must be Matriculated Students of the Medical Department, and also perpetual Pupils of the Hospital.

Their first Winter Session must commence in October, 1860.

The Examination will be in the following subjects:—

1. DIVINITY.—The Books of Exodus and Numbers. The Gospel according to St. Mark, in Greek. The Church Catechism, with Scripture proofs.

2. THE GREEK AND LATIN CLASSICS.—Xenophon, The Hellenics, Book II.; Virgil Georgics, Book III.; and Æneid, Book V.

3. ENGLISH LANGUAGE AND HISTORY.—Milton's Minor Works, *i. e.* including all but Paradise Lost and Regained. The Commonwealth.

4. MATHEMATICS.—Arithmetic; Algebra, as far as Quadratic Equations; Euclid Book I.; Book II. except Props. 8, 9, 10; Book III.

5. THE MODERN LANGUAGES.—French: Histoire des Protestans de France, par De Félice. German: Grosz-Hoffinger's Erzherzog Karl von Oesterreich.

An equal number of marks is assigned to each of the five subjects. A want of sufficient knowledge in Divinity absolutely disqualifies from further examination; but candidates may omit any other subjects which they think proper.

These Scholarships may be held for three or for two years respectively, provided the Scholar continues so long attending Lectures in the Medical Department at King's College, and provided he shall produce to the Council, at the close of his First and Second Academical Year respectively, a Certificate signed by the Principal, the Chaplain, and the Dean of the Medical Department, (1) of good conduct; (2) of regular attendance on the daily Chapel Service, and (3) the Divinity Lectures; and (4) of satisfactory progress in his Religious and Medical studies during the year then past. The Scholarship will become void at the close of the Academical Year in which such Certificate is not obtained.

For further particulars respecting the Examination, &c. for these Scholarships, see the King's College Calendar.

The days of Examination for 1860 are fixed as follows:—

Friday, September 28:—

10 to 3. DIVINITY. { 1½ hour to each of the three subjects, with short intermissions.

Saturday, September 29:—

9 to 11. LATIN.
11½ to 1½ GREEK.
3 to 5. FRENCH.

Monday, October 1:

9 to 2. MATHEMATICS. { 1½ hour to each of the three subjects with short intermissions.

Tuesday, October 2:—

9 to 11. HISTORY.
11½ to 1½. ENGLISH LITERATURE.
3 to 5. GERMAN.

CLASS II.

FOR THE

Encouragement of Resident Medical Students.

ONE SCHOLARSHIP will be awarded at the close of the month of July, 1861, of the value of £25 per annum, to be held for two years, subject to the provisions hereafter stated.

This Scholarship is open to all *Second Year* Matriculated Students of the Medical Department, being also perpetual Pupils of the Hospital, who during

At least Six Months of their First Academical Year, and the Whole of their Second Academical Year, } have

resided within the limits of the College, and who produce to the Principal the following certificates; viz. (1) of good conduct from the Censor, or from the Physician or Surgeon with whom he has been residing; (2) of regular attendance on the Sunday and daily Chapel Service, and (3) on the Divinity Lectures, from the Chaplain; and (4) of satisfactory attention to the regular Medical studies, from the Dean of the Department.

The Examination for 1861 will be in the following subjects:—

I. Divinity:—

1. The Prophecy of Jeremiah, with contemporary histories.
2. The Gospel according to St. Mark.
3. Butler's Analogy, Part II. Ch. i. iii. v.
4. The First Six of the Thirty-Nine Articles.

II. Candidates will be required, at the time of examination,

1. To write from memory the particulars of four cases which shall have been treated in the Hospital during the previous Academical Year. Each Candidate may select his own cases; but no two cases selected by him may be taken from the practice of the same Physician or Surgeon.
2. To give, in writing, with the aid of notes taken by himself at the time, the substance of four of the Clinical Lectures which shall have been delivered in the Hospital by the Medical Officers thereof during the previous Academical Year. The Lectures to be selected by the Examiners.
3. To answer, either *vivâ voce*, or in writing, as the Examiners may direct, four questions on cases which shall have occurred or been treated within the Hospital in the practice of the Physicians and Surgeons thereof, in the current Session.

N.B. Candidates who have been holding Hospital Appointments in the year preceding the Examination, have the liberty of stating, at the time they give in their names, which of the two Physicians and which of the two Surgeons they have had the opportunity of attending, and they will be examined only in the Clinical Lectures and Clinical Teaching given by such Physician and Surgeon.

An equal number of marks is assigned to each of the two great divisions of the Examination; viz. Divinity and Hospital Practice; but a want of sufficient knowledge in Divinity absolutely disqualifies from further examination.

These Scholarships are tenable only so long as the Scholar continues to attend Lectures in the Medical Department, and to reside within the limits of the College; unless, previously to the expiration of the two years for which the Scholarship is tenable, the Scholar have passed the necessary examinations required by the College of Surgeons and the Society of Apothecaries, or have been excused from further residence by the Council of King's College, for any cause that may to them seem reasonable: provided also that, at the close of his Third Academical Year, each Scholar on this Foundation shall produce to the Council a certificate, signed by the Principal, the Chaplain, and the Censor of the College, and by the Dean of the Medical Department, (1) of good conduct; (2) of regular attendance on the Sunday and daily Chapel Service, and (3) on the Divinity Lectures; and (4) of satisfactory progress in his Religious and Medical studies during the year then past. Unless such Certificate is produced, the Scholarship will become void at the close of that Academical Year.

Residence of Students.

Rooms are provided within the walls of the College, for the residence of a limited number of Matriculated Students.

The Censor of the College, the Rev. J. J. S. Perowne, M.A., Fellow of Corpus Christi College, Cambridge, lives within its walls, and to him is committed by the Council the superintendence of all resident Students.

TERMS AND RULES AS TO PAYMENT.

		Academical Year,	Winter Session.	Summer Session.	Single Term.
		£	£ s. d.	£ s. d.	£
No. 1.	Sitting-room and Bed-room separate	60	45 0 0	20 0 0	22
2.	Ditto ditto ditto	55	41 5 0	18 6 8	20
3.	Ditto ditto in one.....	50	37 10 0	16 13 4	18
4.	Ditto ditto ditto	50	37 10 0	16 13 4	18
5.	Ditto ditto separate.....	60	45 0 0	20 0 0	22
6.	Ditto ditto ditto	60	45 0 0	20 0 0	22
7.	Ditto ditto in one.....	50	37 10 0	16 13 4	18
8.	Ditto ditto ditto	50	37 10 0	16 13 4	18
9.	Ditto ditto separate.....	60	45 0 0	20 0 0	22
10.	Ditto ditto ditto	60	45 0 0	20 0 0	22
11.	Ditto ditto in one.....	50	37 10 0	16 13 4	18
12.	Ditto ditto ditto	50	37 10 0	16 13 4	18
13.	Ditto ditto separate.....	55	41 5 0	18 6 8	20
14.	Ditto ditto ditto	60	45 0 0	20 0 0	22
18.	Ditto ditto in one.....	50	37 10 0	16 13 4	18
19.	Ditto ditto separate.....	60	45 0 0	20 0 0	22
20.	Ditto ditto ditto	55	41 5 0	18 6 8	20
21.	Ditto ditto ditto	50	37 10 0	16 13 4	18
22.	Ditto ditto ditto	60	45 0 0	20 0 0	22
23.	Ditto ditto ditto	60	45 0 0	20 0 0	22
24.	Ditto ditto ditto	55	41 5 0	18 6 8	20
25.	Ditto ditto ditto	50	37 10 0	16 13 4	18
26.	Ditto ditto ditto	60	45 0 0	20 0 0	22
27.	Ditto ditto ditto	60	45 0 0	20 0 0	22
28.	Ditto ditto ditto	55	41 5 0	18 6 8	20
29.	Ditto ditto ditto	50	37 10 0	16 13 4	18

In these amounts are included the *whole* expenses of Rent for Furnished Rooms, Attendance during the Academical Year, Coals during the Michaelmas and Lent terms or the Winter Session, and of Dinner in the College Hall during the time that Lectures continue.

Students have to bring their own linen, and to find their own cups and saucers, &c. for their rooms. These articles, however, as well as bread, butter, tea, sugar, &c. for breakfast, can be obtained through the Manciple of the College, at fixed prices.

All Students, not belonging to the Medical Department, must take rooms for at least two terms upon first coming to reside. Medical Students taking rooms in October, must engage them for the whole Winter Session. The amount may be paid in full upon entrance; or one-half upon entrance, and the remainder at the beginning of the second division of the Session, and not later than January 21. A Student will not be allowed the benefit of the reduction made to those who take rooms for the whole year, unless he declares this to be his intention upon entrance. In this case he will be required to pay *the whole of the Fees for the year* upon entrance, or in two portions, as before mentioned.

Three months' notice is to be given of the intention of any Student to give up his rooms.

In the event of any vacancy occurring, Students will have the preference of changing their rooms according to length of residence in College. Three days' notice will be given in the College Hall of vacancies as they occur.

All fees are payable in advance.

RULES FOR THE GUIDANCE OF RESIDENT STUDENTS.

Quiet, order, decorum, and peaceful conduct must be strictly observed.

Each Student is required to be at home by Ten o'Clock at night, unless absent by leave of the Censor.

No person can be allowed to enter the College for the purpose of visiting a Student after Ten o'Clock.

Friends visiting Students are required to leave the College before Eleven o'Clock. In case of this rule being under any circumstances infringed, the Student must accompany his friends to the gate, and enter his own and their names, together with their address, in a book kept for the purpose by the Porter. Each Student is held responsible for the orderly and quiet conduct of all friends while leaving his rooms, as well as during their visit there.

Resident Students must dine in the College Hall (in their academical dress) every day, except when absent by leave of the Censor.

Names of Gentlemen authorized by the Council to receive Medical Students into their houses as Boarders, under rules laid down by the Council for their guidance.

John Wood, Esq. Demonstrator of Anatomy, 4, Montague Street, Russell Square.
W. B. Gill, Esq. M.D. 5, Cambridge Place, Albany Street.
C. Holthouse, Esq. 9, New Burlington Street.
H. Hyde Salter, Esq. M.D. 6, Montague Street, Russell Square.

Names of Gentlemen authorized by the Council to receive General Literature, Applied Sciences, Military, and Civil Service Students into their houses as Boarders.

Rev. T. A. Cock, M.A. 18, Rodney Street, Pentonville, Lecturer in Mathematics.
H. J. Castle, Esq. 21, Euston Square, Lecturer in Surveying.
J. Summers, Esq. Professor of Chinese, 17, Regent Square.
Rev. A. S. Thelwall, 43, Torrington Square, Lecturer in Public Reading.
Rev. J. O'Reilly, 35, Westbourne Park Villas, Lecturer in Military Science.
C. Tomlinson, Esq. 12, Bedford Place, Hampstead Road, Lecturer on Science in King's College School.
Rev. J. J. Heywood, 22, Bedford Place, Russell Square, Master of the Lower Sixth Class in King's College School.

KING'S

COLLEGE,

LONDON.

Evening Classes.

1. Classes for Evening Instruction are held at King's College during the months from October to March, inclusive, and during the months of April, May, and June.

2. The Winter Course for 1860-1 will commence on Monday, October 15, and will terminate on Friday, March 22.

There will be a Vacation of four weeks at Christmas, commencing from after Friday, December 21, 1860. The Classes will meet again on Monday, January 21, 1861.

The Summer Course for 1861 will commence on Monday, April 8, and will continue till the end of June.

3. The following are the subjects of the Winter Course :—

1. DIVINITY.
2. LATIN. (Four Classes.)
3. GREEK. (Four Classes.)
4. FRENCH. (Six Classes.)
5. GERMAN. (Four Classes.)
6. ITALIAN. (Two Classes.)
7. ENGLISH LANGUAGE AND COMPOSITION. (Four Classes.)
8. ANGLO-SAXON.
9. HISTORY } OF ENGLAND.
10. GEOGRAPHY }
11. ARITHMETIC AND BOOK-KEEPING.
12. MATHEMATICS (including Algebra, Euclid, Trigonometry, Differential and Integral Calculus. (Six Classes.)
13. THE PRINCIPLES OF COMMERCE AND COMMERCIAL LAW.
14. DRAWING. (Landscape, Figure, Model, and Architectural.)
15. THE ELEMENTS OF CHEMISTRY.
16. MECHANICS.
17. PHYSIOLOGY.
18. BOTANY.
19. ECONOMIC SCIENCE AND STATISTICS.
20. EXPERIMENTAL PHYSICS.

If any number of Gentlemen, not less than Ten, shall wish for instruction in Hebrew, Spanish, Mineralogy, or other subjects, arrangements will be made (if possible) to meet their wishes.

4. The following are the Fees for the Winter Session:—

(1.) For any single Course (except Divinity), £1 11*s.* 6*d.* For the Divinity Class only, 10*s.* 6*d.*

(2.) The Divinity Class is free to all Students attending any other Class.

(3.) For any four Classes £5 5*s.*

(4.) In the case of several Gentlemen entering from one Firm or Company, the following will be the fees:—

	For any single Course.	For any four Classes.
If more than five in number,	£1 6 3 each person.	£4 4 0 each person.
If more than ten in number,	1 1 0 „	3 7 6 „

5. After Christmas, the Fee is reduced to £1 1*s.* for One Class; and to £3 10*s.* for Four Classes. The Fees for the Summer Course are the same.

6. Students who enter to four of the Evening Classes, have the privilege of becoming "Matriculated Students of King's College, London," by payment of an additional fee of £2 11*s.* This includes the cost of the College Cap and Gown. Students who matriculate in any one year, paying for four Classes, are retained on the list of Matriculated Students in subsequent years, provided they enter to at least two classes.

Matriculated Students are required (unless specially exempted) to attend the Divinity Class on Wednesday Evening.

7. All Fees to be paid upon entrance. It is important to the College authorities that the entries for each Session should be made a few days before the day fixed for the commencement of the course, in order that the necessary arrangements as to Lecturers and Lecture-rooms may be properly made.

8. A Testimonial of Character, from the Clergyman of the District, or some other known person, is, in every case, required upon entrance.

9. The following is the Time Table for the next Winter Course:—

	Monday.	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
6 to 7	Mechanics. Botany.	*Mathematics. *English. *Italian. Econ. Science.		Mechanics.	*Mathematics. *English. *Italian.
7 to 8	Latin. Commerce. *German. Chemistry.	*Mathematics. *English. *Italian. *French. Drawing.	Divinity.	Latin. Commerce. *German. Chemistry.	*Mathematics. *English. *Italian. *French. Drawing.
8 to 9	Greek. *German. Arithmetic.	*French. History. Anglo-Saxon.	Exp. Sciences. Physiology.	Greek. *German. Arithmetic	*French. Geography. Anglo-Saxon.

* Students in these subjects may attend either hour on the two appointed evenings; or may take their two hours on one evening; or by the payment of an additional sum of £1 1*s.* (14*s.* after Christmas) may attend both hours on both evenings.

10. The Library of the College is open for the purposes of study to all Gentlemen joining any of these Classes, from 5.30 to 8, every Monday, Tuesday, Thursday, and Friday, without additional fee.

Associates and Students of the regular Departments of the College are admitted to the Library, during the evening, on payment of 10*s.* 6*d.* each.

11. Names of the Gentlemen who give instruction in these Classes:—

1. *Divinity*	Rev. Professor Plumptre, M.A.
2. *Latin*	Rev. C. U. Dasent, M.A. Rev. A. I. Mc Caul, B.A. John Lamb, Esq. Rev. W. Howse, M.A.
3. *Greek*	C. H. O. Daniel, Esq, B.A. Rev. A. I. Mc Caul, B.A. John Lamb, Esq. Rev. W. Howse, M.A.
4. *French*	Professor Mariette, M.A. Mons. Stievenard, Mons. Thibaudin, Mons. Isnard.
5. *German*	Rev. Dr. Wintzer, Herr Schneider.
6. *Italian*	Professor Pistrucci.
7. *English Language and Composition*	Henry Morley, Esq. A.K.C. Rev. O. Adolphus, M.A.
8. *Anglo-Saxon*	Henry Morley, Esq.
9. *History* 10. *Geography* } *of England*	Decimus Sturges, Esq. B.A. William Hughes, Esq. F.R.G.S.
11. *Arithmetic and Book-keeping*	James Haddon, Esq. M.A.
12. *Mathematics*	Rev. T. A. Cock, M.A. G. R. Smalley, Esq. B.A. T. S. Carte, Esq. M.A.
13. *Principles of Commerce*	Professor Leone Levi.
14. *Drawing*	Professor De La Motte.
15. *The Elements of Chemistry*	Professor C. L. Bloxam.
16. *Mechanics*	G. R. Smalley, Esq. B.A.
17. *Physiology*	Professor Beale, M.B.
18. *Botany*	Professor Bentley, F.L.S.
19. *Economic Science and Statistics*	Rev. Professor Rogers, M.A.
20. *Experimental Physics*	Professor Maxwell, M.A.

12. The following will probably be the course for the Summer Session, 1861:—

Monday.	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
Chemistry. Greek. German.	Mathematics. Italian.	English. Physiology.	Nat. Philosophy. French. Arithmetic.	Latin. Commerce.

Most of these Classes have special reference to the B.A. and Matriculation Examinations at the University of London.

The Hour of Meeting will be 6.30 p.m.; each Class will last one hour and a half.

The Fee for each separate subject will be 1*l.* 1*s.*; for Four Classes, 3*l.* 10*s.*; for Five Classes, 4*l.* 4*s.*

13. Prizes and Certificates.

1. At the close of each Winter Session, examinations are held in each subject; Prizes, and Certificates of Honour and Merit are then given.

2. A Prize will be given to each of the first 5 Students who gain the highest aggregate number of Marks in all the subjects, including Divinity, which they respectively bring up for examination at the end of the Winter Session; provided only that no prize will be given for a less aggregate than 300 marks.

3. In each Class for which not less than 10 Students have entered, there will be offered :—

a. A Prize (or Certificate of Honour at his option) to the Student who shall be highest in the examination.

b. Certificates of Merit (One Certificate to each of the Students next in succession who shall gain not less than three-fifths of the marks allotted to the subject.)

4. Whenever a Class is divided into two or more divisions, each division will be treated as a distinct Class, as regards Prizes and Certificates.

5. There is also an examination on each subject at the close of each Summer Session, and Certificates of Merit are then given to all who obtain three-fifths of the whole number of marks.

6. The Prizes and Certificates are open to ALL Students of the Evening Classes.

7. No Prize or Certificate can be awarded, unless earned by—

a. Regular and punctual attendance. *b*. Good conduct. *c*. Absolute merit in the examination.

8. The highest number of marks assigned to each subject is 100. The standard for "absolute merit," which alone will carry a Prize or Certificate of Honour, will be 75. The standard for "Certificates of Merit" is 60.

9. Certificates of having obtained a College Prize, made out under the signatures of the Principal and Secretary, may be obtained by application at the College Office. Fee 2*s*. 6*d*. for each Certificate.

14. Scholarships and Prizes open to all Matriculated Students of the College.

For the conditions on which such Scholarships and Prizes are open to Matriculated Students of the Evening Classes, see the King's College Calendar.

15. The Associateship of King's College, London.

Rules under which this rank is granted to Students of this Department.

A. Regular and punctual attendance on twelve Courses of Lectures, in ddition to three Winter Courses of Divinity.

1. The twelve Courses may be taken in any number of subjects taught in the Evening Classes of King's College, being not less than two.

2. A Student must attend at least two Courses in each Winter Session.

3. The attendance must extend over a period embracing at least three Winter Sessions, except in the case of Students entering after Christmas, who may reckon their *time* from the beginning of the Winter Session.

4. Credit will not be given for an attendance on more than four Classes, exclusive of Divinity, in any one Session.

5. The Matriculation Fees (£2 11*s.*) and the Fees for four Courses (£5 5*s.*) must be paid at the commencement of the first Winter Session; but in the event of the Student being unable to attend all the four Courses, he may obtain, by application to the Principal, exemption from one, or at the most two, of them, in which case the difference between the amount due for the Courses he has attended and the £5 5*s.* which he has paid, will be allowed in his second payment.

6. In the case of Students who begin their attendance after Christmas, an attendance on two Courses during the remaining half Session will be held to be equivalent to one Course during the whole Winter Session.

7. The foregoing regulations apply to Courses of Lectures held during the Winter Session; but an attendance on two courses during a Summer Session will be reckoned for one Winter Course.

B. Good conduct throughout the time occupied by the Student's attendance.

C. Attendance at the College Chapel on Sunday Morning during the time that the Student is attending the Evening Classes, unless specially exempted by the Principal.

D. Gaining during the course of time occupied in attendance either

(1.) A Prize;

or (2.) A Certificate of Honour;

or (3.) Two Certificates of Merit. This rule applies to Certificates gained in the Winter Session; but two Certificates gained in a Summer Session will be allowed for one Winter Certificate.

E. Gaining at least half marks in an examination to be held at the time of applying for the Associateship.

(1.) In Divinity.

(2.) In any other three of the subjects taught in the Evening Classes of King's College; these to be selected by the Candidate himself.

F. For the privileges of an Associate, see the King's College Calendar.

G. Students intending, at any future time, to apply for the Associateship, must take out at the close of their first Session a Schedule, on which the fact of their attendance in each class will be recorded. See Calendar.

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16. Further information may be obtained, and Fees paid, at the Secretary's Office, from 10 to 4 daily; also in the Library of the College, after the commencement of Lectures, from 6 to 8 P.M. on Monday, Tuesday, Thursday, and Friday.

17. The Principal, as a general rule, will be ready, after the commencement of the Course, to receive Students for the purpose of registering them upon the College Books, at 6.45 on Tuesday and Thursday evenings.

A detailed Syllabus of the Lectures given during the Winter Session will be found in the College Calendar, price 2*s.* 6*d., or* 3*s. per post;* OR IT MAY BE OBTAINED IN A SEPARATE FORM, PRICE TWOPENCE, *or Threepence per post. Apply to* J. W. CUNNINGHAM, Esq., *King's College, London.*

N.B.—The next day fixed for the admission of new Pupils, is Tuesday, September 18, 1860.

KING'S COLLEGE, LONDON.

The School.

Head Master.—REV. J. R. MAJOR, D.D.

Vice-Master.—Rev. J. Fearnley, M.A.

Assistant Masters.

T. S. Carr, Esq. M.A.
Rev. T. O. Cockayne, M.A.
Rev. W. Hayes, M.A.
Rev. George Rust, M.A.
Rev. J. D. Kingdon, M.A.
Rev. C. U. Dasent, M.A.
Rev. Otto Adolphus, M.A.
T. S. Carte, Esq. M.A.
Rev. J. H. Standen, M.A.
Rev. G. F. Maclear, M.A.

Mathematical Master.—George Robarts Smalley, Esq. B.A.
Arithmetical and Second Mathematical Master.—J. Haddon, Esq. M.A.
Writing and Second Arithmetical Master.—J. W. Le Jeune, Esq.
Assistant Writing and Arithmetical Master.—G. E. Morphett, Esq.
French Language.—M. Thibaudin, Master, and M. Wattez and M. Isnard, Assistant Masters.
German Language.—Rev. A. Wintzer, Ph. D. Master.
Geometrical Drawing.—T. Bradley, Esq. Professor.
Landscape Drawing.—P. H. De la Motte, Esq. Professor.
Lecturer on Science.—Charles Tomlinson, Esq.

King's College School consists of two divisions:—

A. The "Division of Classics, Mathematics, and General Literature."

B. The "Division of Modern Instruction."

A.

Division of Classics, Mathematics, and General Literature.

1. This division is intended to prepare Pupils for the Universities, for the Theological, General Literature, and Medical Departments in the College, and for the learned professions.

2. The regular course of Instruction comprises Divinity; the Greek, Latin, English, and French Languages; Mathematics, Arithmetic, Writing; History, and Geography. Hebrew is also taught to the Upper Sixth Class.

3. German is taught, without any additional charge, to Pupils of the sixth, fifth, and fourth Classes, after the regular School hours, on Wednesday, from ½-past 1 to 3, and on Saturday, from 12 to ½-past 1. Pupils of the lower Classes may learn this Language on payment of 10*s.* 6*d.* per term.

4. Instruction in Drawing may also be obtained by all pupils on Tuesday and Friday, after the regular School hours, on payment of 14*s.* a term, including drawing materials.

5. Scholarships.—Two of 30*l.* (one in Classics and one in Mathematics) for three years; four of 20*l.* (one for each division, and two in Mathematics); two of 15*l.*; two of 10*l.* two of 8*l.*; and two of 6*l.*; are annually given, in the Lent Term, to those Pupils who shall pass the best examinations.

Division of Modern Instruction.

1. This Division is placed under the general direction of the Rev. John Fearnley, M.A., Vice-Master of King's College School, assisted by the Rev. J. H. Standen, M.A., T. S. Carr, Esq. M.A., and by the Mathematical, Arithmetical, French, German, and Drawing Masters.

2. The object in view in this Division is to prepare Pupils for general and mercantile pursuits, for the Departments of Engineering, Architecture, and Military Science in the College, for the Military Academies at Woolwich, Sandhurst, and Addiscombe, and for the Royal Navy and the Commercial Marine.

3. Pupils in this Division take corresponding rank with those in the Division of "Classics, Mathematics, and General Literature."

4. The Mathematical Scholarships, of 30*l.* and 20*l.*, are open to pupils in this Division.

5. The regular course of Education in this Division commences with the Lower First Class.

6. In addition to the regular course of Instruction in the Modern Languages, it has been thought advisable to introduce French and German Conversational Classes, with the view of imparting to the Pupil, by the daily habit of conversation, a facility for expressing himself in these languages, and thereby superseding as far as possible the necessity of a residence upon the continent.

7. Separate Classes are also formed, so as to give special extra Instruction, gratuitously, to boys preparing for any of the following; viz.—

1. Commercial pursuits.
2. Military and Naval studies.
3. Engineering and Architecture.

General Rules and Regulations,

Applicable to the whole School.

1. All boys above the Second Class, (the First and Second Classes being common to both Divisions,) will be placed in whichever Division their parents or guardians shall select. Pupils may at any time be moved from one Division to the other.

2. The general age of admission is from nine to sixteen years.

3. The duties of each day commence with Prayers and the reading of the Scriptures in the College Chapel, from which none of the Pupils are allowed to absent themselves.

4. The periods for the admission of Pupils are, the middle of January; the beginning of May; and the middle of September.

Before entering a pupil, the Head Master must be furnished with a *testimonial of good conduct from the applicant's last instructor*, as well as such particulars with respect to his previous studies as may lead to a correct classification.

5. The Hours of attendance are:—

On Monday, Tuesday, Thursday, and Friday, from..... 9 o'Clock to 3.
On Wednesday, from ..... 9 o'Clock to 1.
On Saturday, from ..... 9 o'Clock to 12.

Pupils who are irregular in their attendance, or inattentive to their studies, will be detained one hour longer, under the charge of a Master; and in each case a letter will be sent to the parent or guardian, stating the cause of the detention.

6. The Vacations consist of seven weeks in Summer; one month at Christmas; and five days at Easter. Pupils are expected to attend the School till the Vacations commence, and to return punctually when they close.

7. There is annually, previous to the Summer Vacation, a public distribution of Prizes awarded by the Council. Examinations for places in the Classes, for promotion, and for Prizes, take place each Term.

8. A Register is kept by the Head Master and the other Masters, of the attendance, employments, and general conduct of the pupils; of which periodical reports are transmitted to their friends.

9. Instruction may also be obtained within the College, in Italian, Chinese, Hindustani, Fencing, Singing, and Dancing.

10. A course of eight elementary Lectures is given each term to each Division, on some subject connected with Art or Science.

11. The terms for the whole regular course of Instruction, in either Division, *including Stationery and the use of Books*, are 7*l.* 15*s.* 2*d.* per Term. There are three Terms in each year.

12. Upon entrance, the Fees for the first two Terms must be paid in advance, together with the sum of 1*l.* 1*s.* for the Entrance Fee, 10*s.* for the use of a Box (5*s.* of which is returned when the boy leaves the School and returns the key), and 2*s.* 6*d.* for the College Calendar, amounting altogether to 17*l.* 3*s.* 10*d.* All fees are payable in advance.

13. Upon entering the Sixth Class, each Pupil is called upon to contribute Ten Shillings to the School Library.

14. *Books.*—The Council having resolved to establish the system of Loan with regard to books, no Boys will be permitted, except those in the Upper Sixth Class, or under unusual circumstances, to bring their own books to the School.

15. A sufficient time, at 1 o'clock each day, is allowed for luncheon, which is provided in the College at a regulated expense.

Those parents who may wish their sons to dine at this hour, may avail themselves of an arrangement made for this purpose in the College Hall. One of the Masters always presides. The expense of dinner is—

£4 5*s.* per Term, for six days in the week.
£3 0*s.* ,, for the Monday, Tuesday, Thursday, and Friday in each week.
0 1*s.* 3*d.* per diem for a single dinner.

N.B. It is earnestly requested that parents will, as far as possible, adopt the system of taking out tickets for four or six days, as the case may be, at the beginning of each term, instead of allowing their sons to make daily payments.

16. Pupils who have been in the School two years, and before leaving it have reached the Upper Sixth Class, are entitled to be recommended for election as Associates of King's College, London, after two years' study in the General Literature, Applied Sciences, or Military Departments of the College, instead of after three years as in all other cases.

17. Pupils may reside with their parents or friends. The following Masters receive Boarders on terms sanctioned by the Council, which may be learnt on application to them, or at the Office of the College:—

Rev. J. R. Major, D.D. 42, Bloomsbury Square.
Rev. T. O. Cockayne, M.A. 16, Montagne Street, Russell Square.
Rev. George Rust, M.A. 31, Bedford Square.
Rev. C. U. Dasent, M.A. 68, Guildford Street, Russell Square.
Rev. O. Adolphus, M.A. 15, Tavistock Square.

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18. EXTRA INSTRUCTION,

After the regular School hours, may be obtained in the following subjects:—

		Per Term. £ s. d.	Per Ann. £ s.
German	Rev. A. Wintzer, Ph.D.	See page 28.	
Drawing	Prof. De La Motte		
Fencing	Professor H. C. Angelo	1 11 6	4 4
Drilling	ditto	0 10 6	
Dancing	Edmund Goodwin, Esq.	1 11 6	4 4
Singing	Professor Hullah	1 1 0	
Workshop	G. A. Timme, Esq.	1 1 0	
Photography	T. F. Hardwich, Esq.	See page 11.	

N.B. No Pupil can be admitted to any of these Classes without producing the College Ticket, signed by the Secretary.

Extract *from the* Charter *of* King's College, London.

"That the Council shall have power to accept, on behalf of the said College, gifts and endowments for promoting particular objects of education, or otherwise, in aid of the general purposes of the College, on such terms and conditions as may be agreed on, for the purpose, between the Council and the person bestowing such gifts or endowments.".

N.B. The Council will be very glad to receive, under the foregoing clause of their Charter, any sum that may be offered to them for the endowment, in whole or in part, of any particular Scholarship or Professorship.

FORM OF BEQUEST TO KING'S COLLEGE, LONDON.

"*I give to the Corporation of the 'Governors and Proprietors of King's College, London,' the Sum of*
Pounds, (for the general purposes of the said Corporation, or for the foundation of Scholarships and Prizes, open to the whole College, or limited to any particular Department,) to be paid exclusively out of such part of my Personal Estate as I can lawfully charge therewith; and I desire that the said Sum of Pounds be paid, free of all deductions, be the Treasurer for the time being of the said Corporation, whose receipt shall be a full and sufficient discharge for the same."

N.B. Information may be obtained from the Principal or the Secretary as to the particular Endowments most needed by the College, and as to the best regulations to be enacted for securing the objects of the Donor.

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R. CLAY, PRINTER, BREAD STREET HILL.

KING'S COLLEGE, LONDON.

Evening Classes.

1. Classes for Evening Instruction are held at King's College during the months from October to March, inclusive, and during the months of April, May, and June.

2. The Winter Course for 1860-1 will commence on Monday, October 15, and will terminate on Friday, March 22.

There will be a Vacation of four weeks at Christmas, commencing from after Friday, December 21, 1860. The Classes will meet again on Monday, January 21, 1861.

The Summer Course for 1861 will commence on Monday, April 8, and will continue till the end of June.

3. The following are the subjects of the Winter Course :—

1. DIVINITY.
2. LATIN. (Four Classes.)
3. GREEK. (Four Classes.)
4. FRENCH. (Six Classes.)
5. GERMAN. (Four Classes.)
6. ITALIAN. (Two Classes.)
7. ENGLISH LANGUAGE AND COMPOSITION. (Four Classes.)
8. ANGLO-SAXON.
9. HISTORY } OF ENGLAND.
10. GEOGRAPHY }
11. ARITHMETIC AND BOOK-KEEPING.
12. MATHEMATICS (including Algebra, Euclid, Trigonometry, Differential and Integral Calculus. (Six Classes.)
13. THE PRINCIPLES OF COMMERCE AND COMMERCIAL LAW.
14. DRAWING. (Landscape, Figure, Model, and Architectural.)
15. THE ELEMENTS OF CHEMISTRY.
16. MECHANICS.
17. PHYSIOLOGY.
18. BOTANY.
19. ECONOMIC SCIENCE AND STATISTICS.
20. EXPERIMENTAL PHYSICS.

If any number of Gentlemen, not less than Ten, shall wish for instruction in Hebrew, Spanish, Mineralogy, or other subjects, arrangements will be made (if possible) to meet their wishes

4. The following are the Fees for the Winter Session:—

(1.) For any single Course (except Divinity), £1 11*s.* 6*d.* For the Divinity Class only, 10*s.* 6*d.*

(2.) The Divinity Class is free to all Students attending any other Class.

(3.) For any four Classes £5 5*s.*

(4.) In the case of several Gentlemen entering from one Firm or Company, the following will be the fees:—

	For any single Course.	For any four Classes.
If more than five in number,	£1 6 3 each person.	£4 4 0 each person.
If more than ten in number,	1 1 0 „	3 7 6 „

5. After Christmas, the Fee is reduced to £1 1*s.* for One Class; and to £3 10*s.* for Four Classes. The Fees for the Summer Course are the same.

6. Students who enter to four of the Evening Classes, have the privilege of becoming "Matriculated Students of King's College, London," by payment of an additional fee of £2 11*s.* This includes the cost of the College Cap and Gown. Students who matriculate in any one year, paying for four Classes, are retained on the list of Matriculated Students in subsequent years, provided they enter to at least two classes.

Matriculated Students are required (unless specially exempted) to attend the Divinity Class on Wednesday Evening.

7. All Fees to be paid upon entrance. It is important to the College authorities that the entries for each Session should be made a few days before the day fixed for the commencement of the course, in order that the necessary arrangements as to Lecturers and Lecture-rooms may be properly made.

8. A Testimonial of Character, from the Clergyman of the District, or some other known person, is, in every case, required upon entrance.

9. The following is the Time Table for the next Winter Course:—

	Monday.	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
6 to 7	Mechanics. Botany.	*Mathematics. *English. *Italian. Econ. Science.		Mechanics.	*Mathematics. *English. *Italian.
7 to 8	Latin. Commerce. *German. Chemistry.	*Mathematics. *English. *Italian. *French. Drawing.	Divinity.	Latin. Commerce. *German. Chemistry.	*Mathematics. *English. *Italian. *French. Drawing.
8 to 9	Greek. *German. Arithmetic.	*French. History. Anglo-Saxon.	Exp. Sciences. Physiology.	Greek. *German. Arithmetic	*French. Geography. Anglo-Saxon.

* Students in these subjects may attend either hour on the two appointed evenings; or may take their two hours on one evening; or by the payment of an additional sum of £1 1*s.* (14*s.* after Christmas) may attend both hours on both evenings.

10. The Library of the College is open for the purposes of study to all Gentlemen joining any of these Classes, from 5.30 to 8, every Monday, Tuesday, Thursday, and Friday, without additional fee.

Associates and Students of the regular Departments of the College are admitted to the Library, during the evening, on payment of 10*s.* 6*d.* each.

11. Names of the Gentlemen who give instruction in these Classes:—

1. *Divinity*	Rev. Professor PLUMPTRE, M.A.
2. *Latin*	Rev. C. U. DASENT, M.A. Rev. A. I. MC CAUL, B.A. JOHN LAMB, Esq. Rev. W. HOWSE, M.A.
3. *Greek*	C. H. O. DANIEL, Esq, B.A. Rev. A. I. MC CAUL, B.A. JOHN LAMB, Esq. Rev. W. HOWSE, M.A.
4. *French*	Professor MARIETTE, M.A. Mons. STIEVENARD, Mons. THIBAUDIN, Mons. ISNARD.
5. *German*	Rev. Dr. WINTZER, Herr SCHNEIDER.
6. *Italian*	Professor PISTRUCCI.
7. *English Language and Composition*	HENRY MORLEY, Esq. A.K.C. Rev. O. ADOLPHUS, M.A.
8. *Anglo-Saxon*	HENRY MORLEY, Esq.
9. *History* 10. *Geography* of England	DECIMUS STURGES, Esq. B.A. WILLIAM HUGHES, Esq. F.R.G.S.
11. *Arithmetic and Book-keeping*	JAMES HADDON, Esq. M.A.
12. *Mathematics*	Rev. T. A. COCK, M.A. G. R. SMALLEY, Esq. B.A. T. S. CARTE, Esq. M.A.
13. *Principles of Commerce*	Professor LEONE LEVI.
14. *Drawing*	Professor DE LA MOTTE.
15. *The Elements of Chemistry*	Professor C. L. BLOXAM.
16. *Mechanics*	G. R. SMALLEY, Esq. B.A.
17. *Physiology*	Professor BEALE, M.B.
18. *Botany*	Professor BENTLEY, F.L.S.
19. *Economic Science and Statistics*	Rev. Professor ROGERS, M.A.
20. *Experimental Physics*	Professor MAXWELL, M.A.

12. THE FOLLOWING WILL PROBABLY BE THE COURSE FOR THE SUMMER SESSION, 1861 :—

Monday.	*Tuesday.*	*Wednesday.*	*Thursday.*	*Friday.*
Chemistry. Greek. German.	Mathematics. Italian.	English. Physiology.	Nat. Philosophy. French. Arithmetic.	Latin. Commerce.

Most of these Classes have special reference to the B.A. and Matriculation Examinations at the University of London.

The Hour of Meeting will be 6.30 P.M.; each Class will last one hour and a half.

The Fee for each separate subject will be 1*l.* 1*s.*; for Four Classes, 3*l.* 10*s.*; for Five Classes, 4*l.* 4*s.*

13. Prizes and Certificates.

1. At the close of each Winter Session, examinations are held in each subject; Prizes, and Certificates of Honour and Merit are then given.

2. A Prize will be given to each of the first 5 Students who gain the highest aggregate number of Marks in all the subjects, including Divinity, which they respectively bring up for examination at the end of the Winter Session; provided only that no prize will be given for a less aggregate than 300 marks.

3. In each Class for which not less than 10 Students have entered, there will be offered :—

a. A Prize (or Certificate of Honour at his option) to the Student who shall be highest in the examination.

b. Certificates of Merit (One Certificate to each of the Students next in succession who shall gain not less than three-fifths of the marks allotted to the subject.)

4. Whenever a Class is divided into two or more divisions, each division will be treated as a distinct Class, as regards Prizes and Certificates.

5. There is also an examination on each subject at the close of each Summer Session, and Certificates of Merit are then given to all who obtain three-fifths of the whole number of marks.

6. The Prizes and Certificates are open to ALL Students of the Evening Classes.

7. No Prize or Certificate can be awarded, unless earned by—

a. Regular and punctual attendance. *b*. Good conduct. *c*. Absolute merit in the examination.

8. The highest number of marks assigned to each subject is 100. The standard for "absolute merit," which alone will carry a Prize or Certificate of Honour, will be 75. The standard for "Certificates of Merit" is 60.

9. Certificates of having obtained a College Prize, made out under the signatures of the Principal and Secretary, may be obtained by application at the College Office. Fee 2*s*. 6*d*. for each Certificate.

14. Scholarships and Prizes open to all Matriculated Students of the College.

For the conditions on which such Scholarships and Prizes are open to Matriculated Students of the Evening Classes, see the King's College Calendar.

15. The Associateship of King's College, London.

Rules under which this rank is granted to Students of this Department.

A. Regular and punctual attendance on twelve Courses of Lectures, in addition to three Winter Courses of Divinity.

1. The twelve Courses may be taken in any number of subjects taught in the Evening Classes of King's College, being not less than two.
2. A Student must attend at least two Courses in each Winter Session.
3. The attendance must extend over a period embracing at least three Winter Sessions, except in the case of Students entering after Christmas, who may reckon their *time* from the beginning of the Winter Session.
4. Credit will not be given for an attendance on more than four Classes, exclusive of Divinity, in any one Session.

5. The Matriculation Fees (£2 11*s.*) and the Fees for four Courses (£5 5*s.*) must be paid at the commencement of the first Winter Session; but in the event of the Student being unable to attend all the four Courses, he may obtain, by application to the Principal, exemption from one, or at the most two, of them, in which case the difference between the amount due for the Courses he has attended and the £5 5*s.* which he has paid, will be allowed in his second payment.

6. In the case of Students who begin their attendance after Christmas, an attendance on two Courses during the remaining half Session will be held to be equivalent to one Course during the whole Winter Session.

7. The foregoing regulations apply to Courses of Lectures held during the Winter Session; but an attendance on two courses during a Summer Session will be reckoned for one Winter Course.

B. Good conduct throughout the time occupied by the Student's attendance.

C. Attendance at the College Chapel on Sunday Morning during the time that the Student is attending the Evening Classes, unless specially exempted by the Principal.

D. Gaining during the course of time occupied in attendance either

(1.) A Prize;

or (2.) A Certificate of Honour;

or (3.) Two Certificates of Merit. This rule applies to Certificates gained in the Winter Session; but two Certificates gained in a Summer Session will be allowed for one Winter Certificate.

E. Gaining at least half marks in an examination to be held at the time of applying for the Associateship.

(1.) In Divinity.

(2.) In any other three of the subjects taught in the Evening Classes of King's College; these to be selected by the Candidate himself.

F. For the privileges of an Associate, see the King's College Calendar.

G. Students intending, at any future time, to apply for the Associateship, must take out at the close of their first Session a Schedule, on which the fact of their attendance in each class will be recorded. See Calendar.

16. Further information may be obtained, and Fees paid, at the Secretary's Office, from 10 to 4 daily; also in the Library of the College, after the commencement of Lectures, from 6 to 8 P.M. on Monday, Tuesday, Thursday, and Friday.

17. The Principal, as a general rule, will be ready, after the commencement of the Course, to receive Students for the purpose of registering them upon the College Books, at 6.45 on Tuesday and Thursday evenings.

A detailed Syllabus of the Lectures given during the Winter Session will be found in the College Calendar, price 2*s.* 6*d., or* 3*s. per post;* OR IT MAY BE OBTAINED IN A SEPARATE FORM, PRICE TWOPENCE, *or Threepence per post. Apply to* J. W. CUNNINGHAM, Esq., *King's College, London.*

NOTICE.

The Editor has again to regret the late appearance of the present number of the Journal, and earnestly begs contributors to forward their communications as early as possible.

VOL. I., price 15*s*., cloth 8vo., with **50 Wood Cuts,** and **32 Lithographic plates,** is now ready. The separate numbers may still be obtained at the usual price, 3*s*. 6*d*. each.

No. V. will commence a new volume. Each volume is complete in itself, and will consist of not more than four numbers.

The price of the Journal will remain the same; but its size, and the number of plates will be increased as soon as the circulation permits.

All Subscribers are requested to forward their names ~~to Mr. John Jones, 10, Grange Court, Carey Street, Lincoln's Inn, W.C.~~

TO ADVERTISERS.

~~Advertisements (which must be prepaid) may be sent to Mr. John Jones, 10, Grange Court, Carey Street.~~

SCALE OF CHARGES.

	£	*s*.	*d*.
Under Five Lines (about 50 words)	0	5	0
Each additional Line	0	1	0
Half a page	1	1	0
A whole Page (or bills inserted)	2	0	0

Advertisements not received later than September 20th, and March 20th.

All other communications to be addressed to the Editor.

Copies will be forwarded on the morning of publication, post free, to gentlemen who send their addresses, accompanied with a remittance for their subscription, to ~~Mr. J. Jones, Pathological Laboratory, 10, Grange Court, Carey Street, W.C.~~

The Editor King's College London

Subscription, 7s. yearly.

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